PUBLIC WORKS

Nov. 1958

CITY, COUNTY AND STATE

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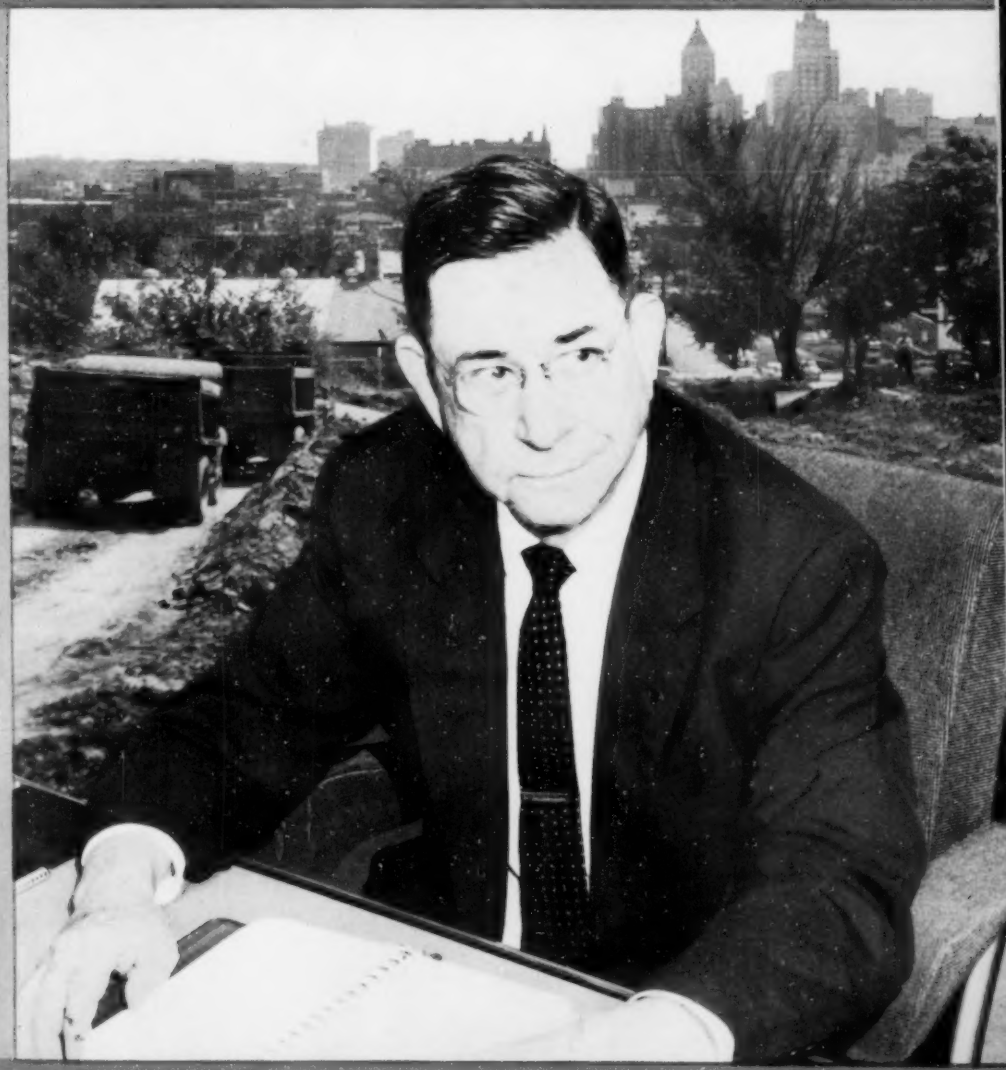

William R. Wooten is City Engineer and Director of Public Affairs for Tulsa, Okla. During his 36 years with the city, its population and area have quadrupled, presenting many engineering problems. More on page 18.

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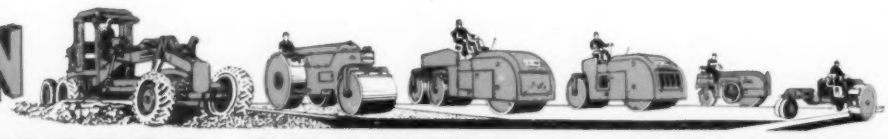
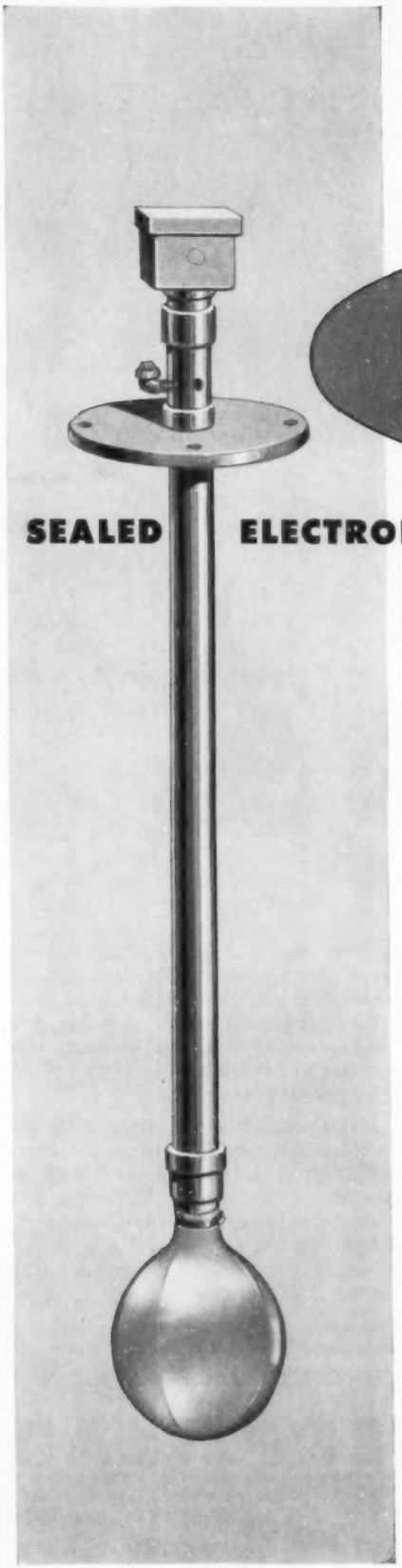


MOTOR GRADERS & ROLLERS



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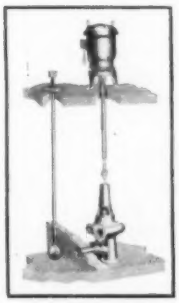
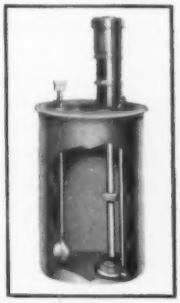


TYPICAL PUMP APPLICATIONS

SEWAGE PUMP **SUMP PUMP**



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Gus Piepenstock, recently retired Assistant Street Superintendent of Redding, is proud of the Cat No. 12 shown leveling area for warehouse site. And he should know — he has worked with No. 12s since they were first introduced by Caterpillar 20 years ago!

"Our new No. 12 is an unbeatable piece of equipment"

That's how Gus Piepenstock, recently honored Assistant Street Superintendent for the city of Redding, Calif., feels about Caterpillar Motor Graders. And he should know. Cited for "21 years of outstanding service to the community," he built many of the streets of Redding with one of the first Motor Graders to come off the Caterpillar Tractor Co. assembly line. Redding has a new No. 12 now, and it's 100% improved.

The city traded the 20-year-old Cat No. 12 on its present machine. And in all that time, the trade-in machine had only *one complete overhaul.* Said Mr. Piepenstock: "There was no end to the good service we got from the old No. 12—used it 5 to 6 days a week. And we didn't have a bulldozer to help out then, and had to use our Cat Motor Grader to do everything."

The city of Redding likes its present rugged No. 12 even better than the veteran machine it displaced. (And even though the two machines look somewhat alike in outward appearance, mechanical advances have been such that only a handful of parts on the new No. 12 are the same as those on the '38 model.) Recently retired Gus Piepenstock says, "Ease of operation and ruggedness make Cat No. 12 Motor Graders unbeatable pieces of equipment. The sliding moldboard saves the city's money by reducing hand work in cleaning ditches and around telephone poles. And another king-sized feature is the electric starting—plus the fact our operator can work all day sitting down and not be all in at quitting time!"

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NOVEMBER 1958

PUBLIC WORKS

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City Establishes Five-Year Street Maintenance Program 75
Planned maintenance program involves a careful survey and scheduled seal coating, resurfacing, and reconstruction. GEORGE H. FELLOWS

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Traffic congestion relief problem is progressively solved with 59 luminaires installed as the latest step. LANE H. MASHAW

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County Develops Comprehensive Refuse Disposal Plan 90
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Wind, rain and a sandy soil call for special measures to preserve highway shoulders and roadside ditches. LAWRENCE F. WAGNER

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Location on a steep bank made necessary the construction of a cofferdam and use of steel pipe piles for bracing. EARL PATTON

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Engine also provides for emergency use. LEROY EBRIGHT

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Many benefits are provided GORDON H. LLOYD

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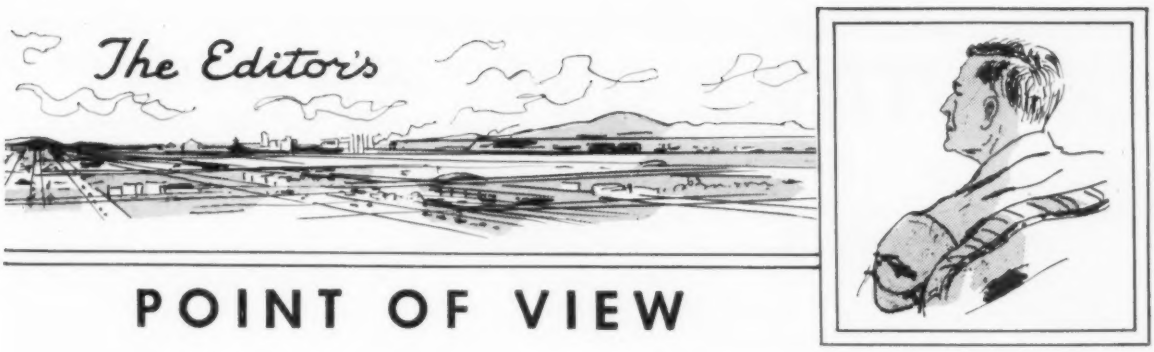

POINT OF VIEW

The Most Important Two Miles: Our Urban Street Problems

IT MAY BE two miles, or more or less, but the most important section of the road is the one that feeds or takes from our through highways. No matter how finely engineered our expressways are, their value is lessened if motorists cannot reach them or if truckers cannot readily get from them to their destination. It does not matter what the impediment is, whether mud or traffic. The time saved by using a 4-lane highway for 100 miles can readily be lost in a very few miles of congested city traffic or on a similar distance of unimproved streets.

These facts emphasize the need for greater consideration of urban problems in connection with our new highway system. Major changes in street systems are extremely costly and require a long time for accomplishment, yet may be necessary if the larger benefits of the new highways are to be attained. The alternative is a new approach to the problem of expressway location, based on full considerations of local conditions, so as to facilitate the essential feeding and taking from while avoiding measures that will result in added local traffic congestion.

There is No Substitute for Good Housekeeping

SOME FIFTEEN years ago, when DDT and like insecticides were introduced, many people felt that man could control insects by the mere dispensing of these wonder chemicals. It was soon apparent that nature was providing, in these various insects, a resistance which would prevent their total elimination. Now we know that there is no substitute for good housekeeping, whether by the homeowner or by the municipality.

This means continued improvement in storage, collection, handling and disposal of garbage and rubbish; in sewage disposal, whether by home or municipal installations; and in street cleaning; and in many other facets of community activities.

It is fortunate, indeed, that nature has not permitted bacteria to develop a resistance to chlorination. Many sanitary defects exist in water supply systems in the form of cross-connections and the possibility of back-siphonage. Chlorination provides a safety factor under these conditions, but it cannot carry all the load. Good municipal housekeeping is as important here as in other public services.

Engineers Should Act as Citizens Also

PUBLIC HEALTH engineers have taken a strong stand in respect to fluoridating water supplies, based on both research and experience. As with many sound and needed projects, there are often local objections. Here is a typical place where organized engineers can and should provide needed support and leadership. The public looks to local engineers and engineering groups for guidance on engineering problems. Failure to speak out is often interpreted as opposition. Indefinite deferment of needed engineering projects is serious; but even more so is the lack of leadership evidenced by the occurrence of such failure.

Engineers have an obligation to learn about the engineering projects that affect their communities, whether fluoridation or something else; and a further obligation to provide leadership for the community in the solution of these problems. Engineers are uniquely qualified for such leadership but too often and regrettably they fail to exert it; and in so failing, they fail their profession.

A case in point is the fluoridation situation in New York City. Though a number of local engineering groups, and many national engineering society headquarters are located there, not a single one of these appears on a recent list of community and scientific organizations endorsing fluoridation. Medical, dental, welfare, business and scientific groups are represented, but not engineering.

Very Deep Sewer Construction vs Pumping Stations

THE COST OF sewer construction increases greatly after a certain depth has been reached, this depth depending on a number of local factors. Generally speaking a 25-ft. deep sewer may cost four to five times as much as a line half as deep. Even the use of modern equipment cannot overcome the cost problem of deep sewer line construction. Ground water, sheeting, soil conditions and the difficulty of getting men and materials into and out of a very deep trench may add to the problem.

In recent years the development of highly reliable non-clogging pumps for handling raw sewage has mitigated the necessity for very deep sewers. The excellent prefabricated pumping stations now available have given the engineer another tool for reducing costs and for speeding up construction, so desirable or necessary now when the volume of traffic requires all possible street and highway capacity.

TAKE THE DOUBT

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   Cast Iron Pipe is inherently tough . . . stands up under heavy traffic load, soil displacement and disturbance.
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   Cast Iron Pipe effectively resists corrosion . . . vital factor in its long life and dependability.
6. **TIGHT JOINTS...**
   A full range of leak-proof, low cost, easy-to-assemble joints for pipe and fittings are available for all conditions.

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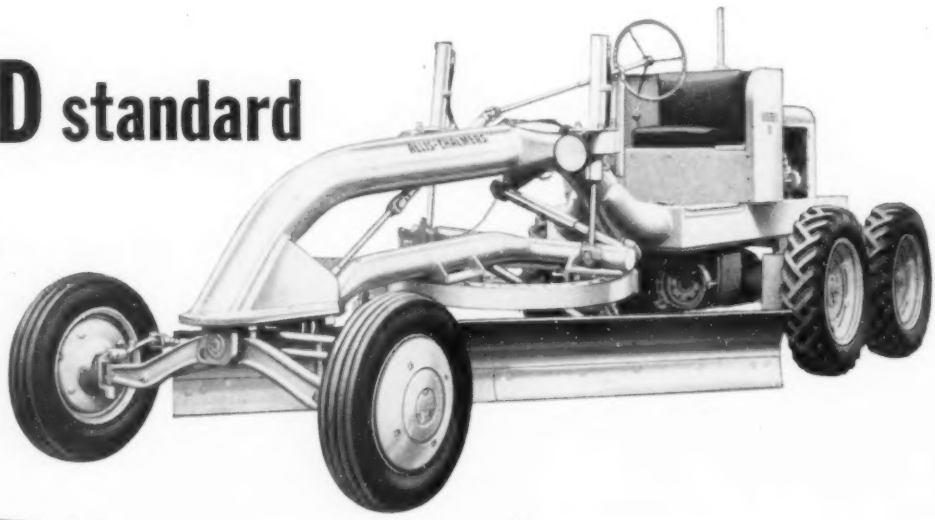
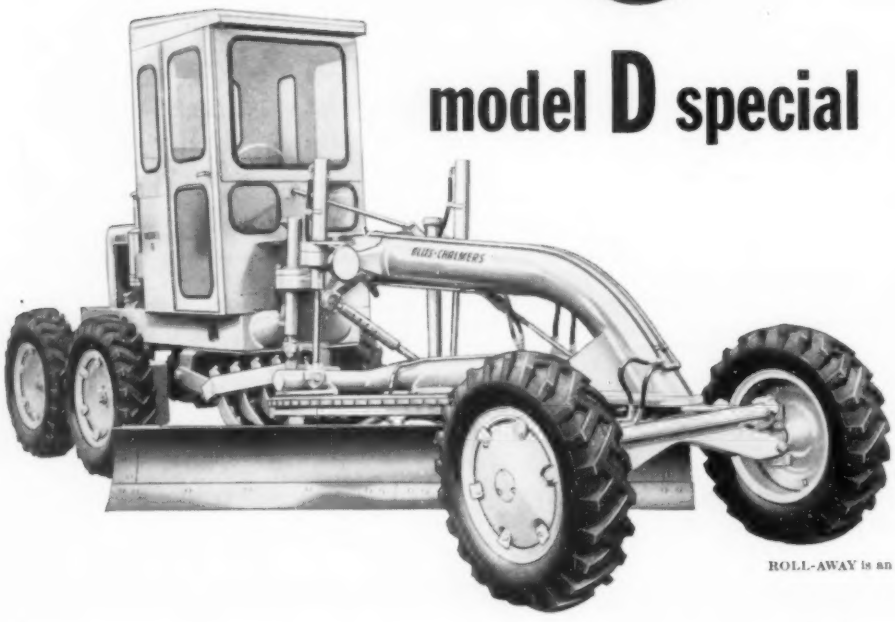
50 hp
Approx. weight
8,800 lb (gasoline)
Approx. weight
9,350 lb (diesel)



model D special



50 hp
Approx. weight
10,900 lb (gasoline)
Approx. weight
11,450 lb (diesel)
4 forward speeds to 25 mph (approx.)
1 reverse speed to 3 mph (approx.)
All-steel cab*
Shiftable moldboard*
Hydraulic scarifier*
Leaning front wheels*
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*Also available with the model D standard as optional equipment.

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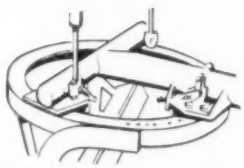
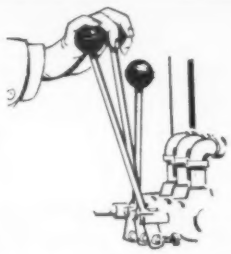
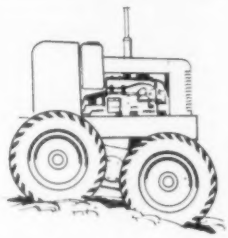


Revolving circle and heavy tubular drawbar provide exceptionally stable moldboard mounting.

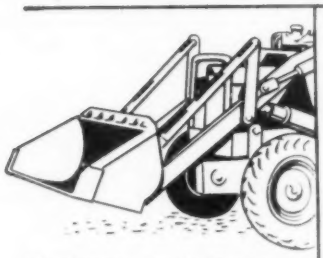


Convenient hydraulic controls, easy to operate. Two levers fit into one hand to control circle lift.

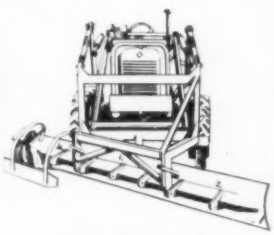


Positive tandem drive gives you four driving wheels under the heavy end of the grader.

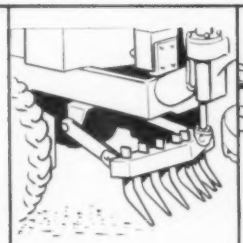
many job-multiplying attachments



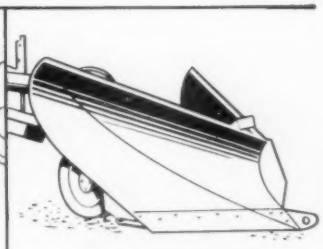
⅝-yd rear-mounted loader



Interchangeable shoulder maintainer



Midship-mounted scarifier



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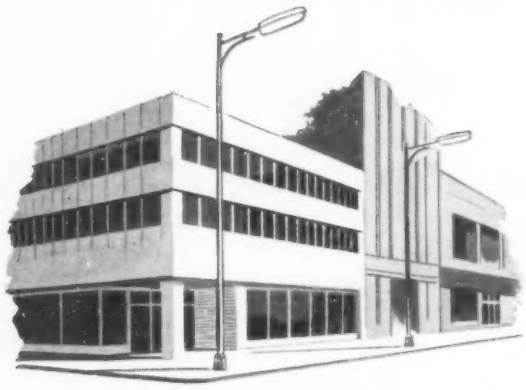

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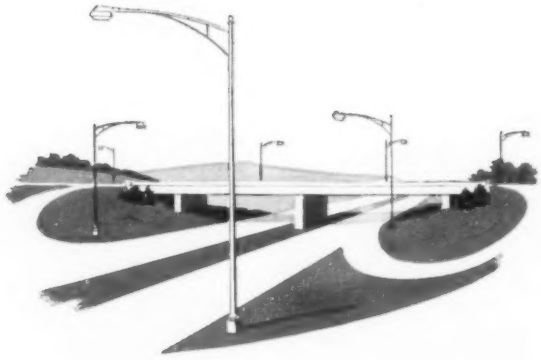

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UNION METAL

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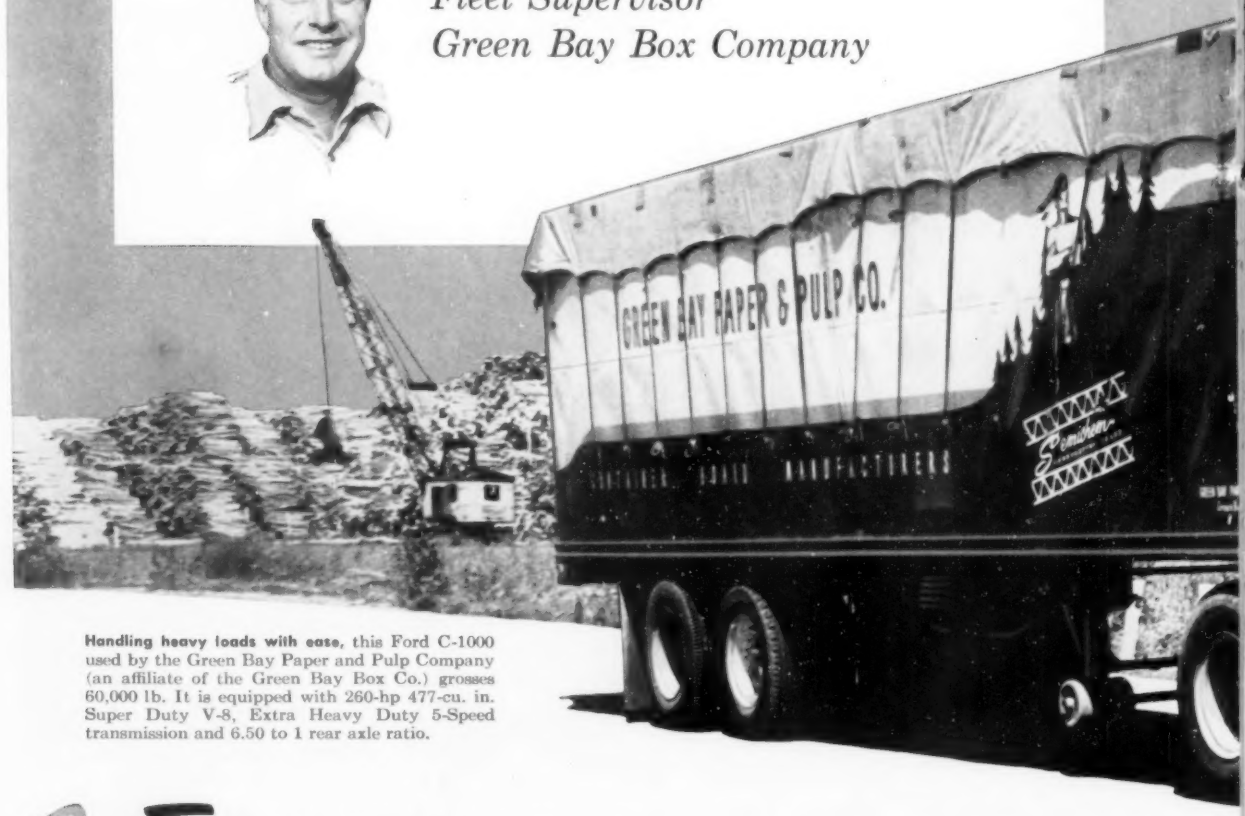
"USING FORD HEAVIES HAS MADE A BIG CUT IN OUR MAINTENANCE COSTS"

says Allen Grosse
Fleet Supervisor
Green Bay Box Company



Handling heavy loads with ease, this Ford C-1000 used by the Green Bay Paper and Pulp Company (an affiliate of the Green Bay Box Co.) grosses 60,000 lb. It is equipped with 260-hp 477-cu. in. Super Duty V-8, Extra Heavy Duty 5-Speed transmission and 6.50 to 1 rear axle ratio.

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Whatever your job . . . wherever you do it—you'll find Ford Heavies and Extra Heavies are engineered and built to do it better! And the '59 improvements in these models will bring still more benefits to your operation.

Greater operating economy with new, faster rear axle ratios and wide choice of transmissions.

More efficient parking brake of the internal expanding type has approximately 50% greater stopping and holding ability, requires less than half the operating effort needed for the previously used type.

Higher payloads and longer life with new, higher-capacity front and rear axle options.

Factory installed tractor package custom-fitted to Ford trucks for safer, more dependable braking.

Yes, the new '59 Ford trucks are here to take you *Ford*-ward for savings, *Ford*-ward for modern style and stamina. See your Ford Dealer today!

"Our records show that our average monthly parts cost, including major overhauls, has been reduced over 24%.

"Our Fords have given us less trouble than any other make of truck we've owned! Also, our Ford Dealer has always given us immediate and very good service. We've never had any downtime waiting for parts. They're always available at our Ford Dealer's, so we don't have the problem or expense of carrying a big parts inventory.

"Our drivers sure like the 'hillability' of the big Ford Tilts with their Super Duty V-8 engines! They say the 'Big V' has sure got it for power that seems to level out the steepest hills. And the Tilt Cabs are tops for maneuverability and riding ease.

"Performance plus economy . . . that's why we're sold on Ford trucks. We started using Fords when we opened our trucking department in 1954, and today 28 of our 35 trucks are Fords."

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The big savings in refuse disposal are made with mechanized, containerized, collection equipment. Dempster Brothers, the pioneer manufacturer of containerization equipment, now offers four efficient systems to help you increase your efficiency and decrease costs.

The DEMPSTER-DUMPSTER handles containers up to 15 cu. yds. The DEMPSTER-DUMPMASTER, available in three sizes, picks up and empties containers from one through six cu. yd. capacity. Compaction bodies are 18, 24 and 30 cubic yards with capacities up to 120 cubic yards of loose refuse. The DEMPSTER Compaction Trailer will hold and haul over 200 cubic yards of loose material per trip and it can be loaded by the DEMPSTER-DUMPSTER GRD-304-F-2. The DEMPSTER-DINOSAUR offers giant containers up to 40 cu. yds. and over. Write today for complete information.

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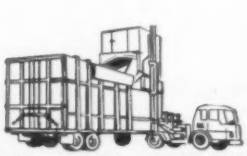

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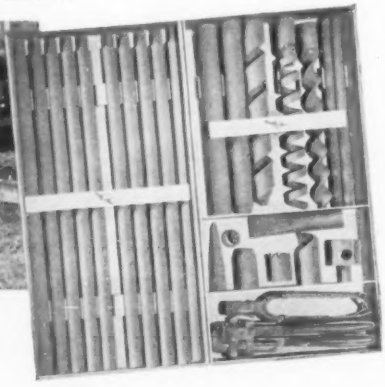
With accurate sub-soil information, you avoid costly trouble later on. And, what better way to get this information than with a portable, easy to use Acker Soil Sampling Kit. For here is a versatile collection of twelve soil sampling tools packed in a handy steel kit that can be carried in any car. Write today for prices and Bulletin 26 PW.



Acker Soil Sampling Kit being used for test borings for bridge foundation. Over 30 years of soil sampling experience make this Acker kit the most useful you can buy!

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Wm. R. Wooten, City Engineer and Director of Public Affairs of Tulsa, Okla., has under his general charge the Departments of Engineering, Traffic Engineering, Protective Inspections and Building Maintenance; and the operation of City Hall, the Municipal Theater, two City Cemeteries and the City's PBX System.

He began his service with the City in 1922, becoming Assistant City Engineer in 1924 and City Engineer in 1939, returning to Principal Assistant from 1944 to 1948, under the old system of political appointments, and reassuming the City Engineer's post in 1948, with the added duties of Director of Public Affairs.

He was a member of the City Planning Commission for 10 years, the Board of Adjustment for 15 years and served two terms as Chairman of the Administrative Council. Since his employment by the City he has seen both its population and area quadruple. "To have the opportunity of helping build so much of a city is a privilege not granted to every man", he said.

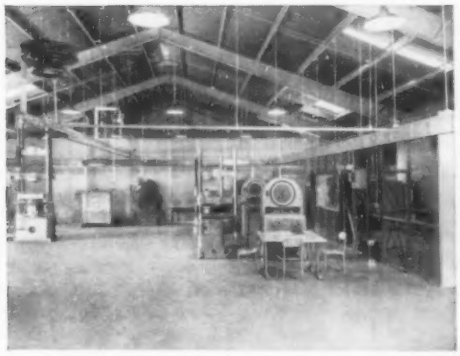
Mr. Wooten received his engineering education at the University of Arkansas. He entered the Army in April, 1917, and was later commissioned 2nd Lt. in Field Artillery. He was an instructor at the 3rd OTC at Camp Pike, and served at Camp Jackson and Camp Taylor. Following the war, he taught High School Mathematics for two years.

He is a Registered Professional Engineer; a past President of the OSPE; a past Director of NSPE; a member of the Engineers Club of Tulsa, the APWA, the American Legion, Sigma Chi and the Baptist Church. He is a widower, the father of one daughter and two sons. He was a recipient of the Samuel A. Greeley Award in 1952.

Temporary Engineering Building No. 1. West Virginia University, Morgantown, West Virginia

THIS PRE-ENGINEERED BUILDING

was planned and completed in 6 months



Temporary Engineering Building No. 2. This Butler building was erected at the same time as the larger building above and serves as a testing laboratory for engineering students. Note the clear, overhead space, the column-free floor area permitting use of moveable partitions.

A raging fire destroyed Mechanical Hall at West Virginia University. Even though a new 10 million dollar agriculture-engineering plant was on the drawing boards, temporary facilities were needed quickly. Within six months school engineers designed the building above, the Butler components were shipped from stock and the building was completed and ready for occupancy.

Fast construction is just one of many advantages Butler pre-engineered components offer. Pre-engineered to meet applicable building codes, they save much tedious routine engineering. Mass-produced, they eliminate custom fabrication. Butler's clear-span, column-free interiors afford full utilization of space. Ventilation and illumination can be controlled easily, economically, to provide a superior environment. Future expansion is fast, easy, and economical.

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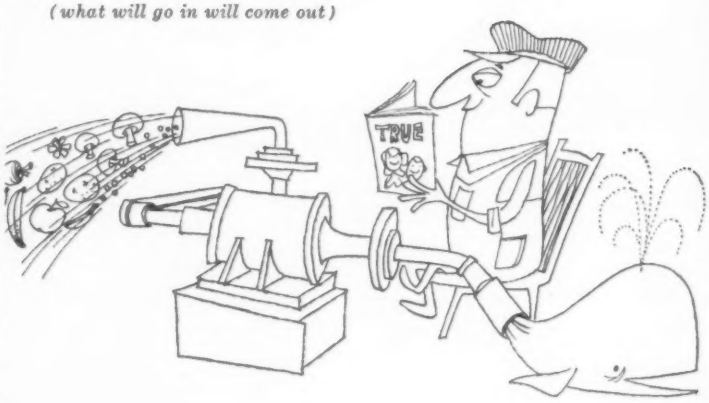

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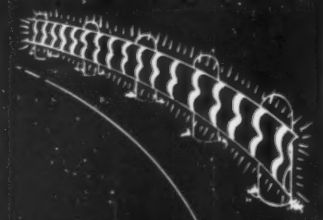

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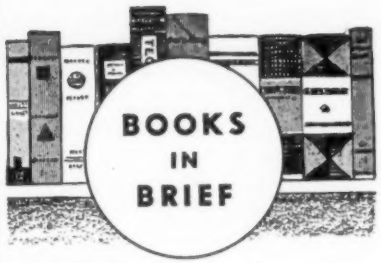

ENVIRONMENTAL SANITATION

This is an excellent book, well written and covering a great many of the areas in which local public health problems arise. There is, of course, a vast difference between the headquarters operation of a large city or county health department and its field application. This book will help both, as it is practical and based on a lot of realistic first-hand experience.

The contents pages, though broad, do not give complete information on the many points covered in the text. The first chapter is for orientation and reference—Control of Communicable Diseases. Other chapters include: Factors in location and planning; water supply and treatment; sewage and waste disposal; swimming pools and bathing beaches; food; insects, rodents and noxious weeds; housing; and administration. There are also four useful appendices.

There has been no text as valuable for the field man as this since Col. Dunham put out his Military Preventive Medicine; and this is a different type of text in that it deals more with application to and solution of sanitation problems. As such it will be very helpful to many men in the field. Every local health department should have a copy; and every health worker also, because it will help him to do his work more effectively.

Environmental Sanitation; J.A. Salvato, Jr.; 637 pages; many illustrations; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. Price is $12.

SOIL STABILIZATION STUDIES 1957

This bulletin contains 5 papers on soil stabilization by means of additives as reported at the 36th Annual Meeting of the HRB. The first, by J. W. Reppel, describes the results obtained with "Salt Stabilization on Ohio's Secondary System," especially the low-traffic farm-to-market portion of the highway network. The second, by R. K. Viskochil, R. L. Handy and D. T. Davidson, de-

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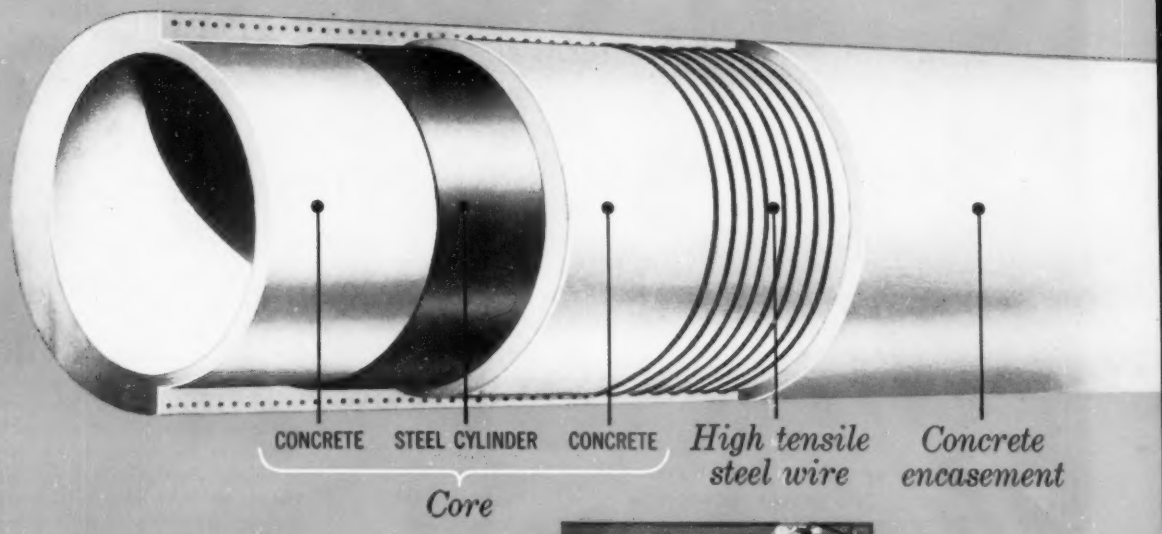
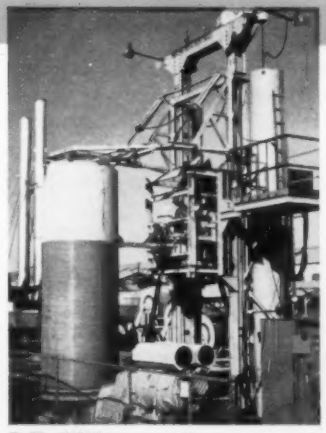
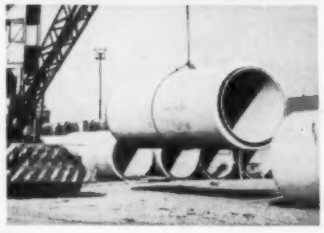
CONCRETE CYLINDER PIPE
(Embedded Cylinder Type)

with Rubber Gasket Joint



All of the good qualities and characteristics desired by water works engineers for permanent water supply and transmission lines are embodied in this prestressed pipe of advanced design: great strength, sustained high carrying capacity, trouble-free service, and unusually long life. Prestressed pipe of this type can be designed more accurately, predictably and economically for most all conditions of internal pressure and external loads than any other type of high quality concrete pressure pipe. It is the finest quality pipe available in medium and large diameters for pressures generally ranging from 100 psi upward. American is currently undertaking the manufacture of this pipe designed for pressures ranging from 275 to 550 ft. of head for a portion of the U.S. Bureau of Reclamation Project being constructed for the Ventura River Municipal Water District. This Ventura River Project will serve 32 square miles of mountainous country with water for irrigation, municipal and industrial use in main and coastal reaches of Ventura County, California. When planning *your* future water "growth lines," look to American's quality pipe line products, extensive production facilities and half century of experience.





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Keep traffic lanes clear, put your spoil off the pavement. The Cleveland 80W backfiller pulls spoil from opposite side of trench, backfills *toward* itself, works parallel to trench and to traffic.

As it backfills, the 80W simultaneously compacts fill, the right way, from the bottom up. Leaves no voids around pipe—no settling, now *or* later.

Result: a clean, safe, *completed* job.

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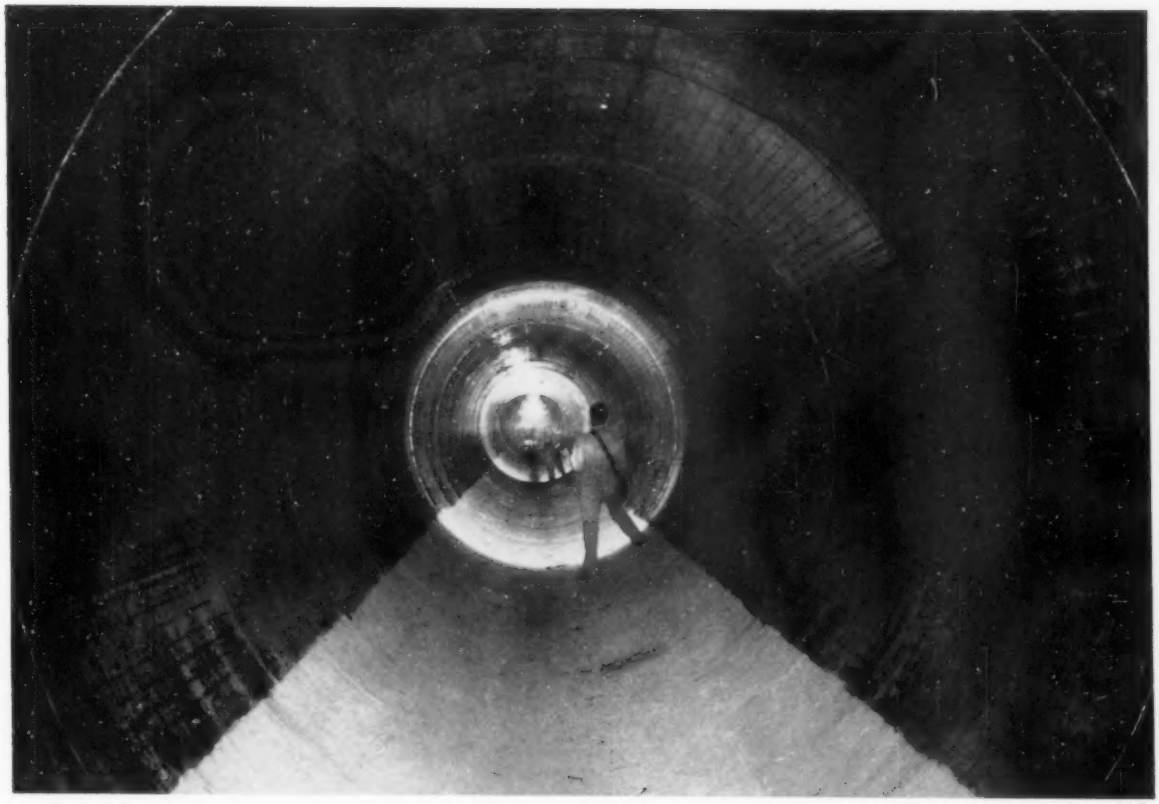
scribes the methods and results of a study on "Effect of Density on Strength of Lime-Flyash Stabilized. Soil." The third, by Eugene A. Miller and George F. Sowers, describes studies on "The Strength Characteristics of Soil-Aggregate Mixtures." Paper four, by Raymond F. Dawson and Chester McDowell, gives the results of the use of dust from "Expanded Shale as an Admixture in Lime Stabilization." The fifth paper, by T. William Lambe and Zu-Cheih Moh, discusses the "Improvement of Strength of Soil-Cement with Additives," including dispersants, synthetic resins, waterproofing agents, and several salts and alkalis. Copies are available from the Highway Research Board, 2101 Constitution, Washington, D.C., and are $1 each.

MANUAL OF ACCIDENT PREVENTION IN CONSTRUCTION

Following an introduction that sets forth the cold facts on the costs of accidents in this Manual of Accident Prevention in Construction, there is a chapter on accident prevention organization, containing some recommendations for making safety work in your own organization by providing an effective action structure. The remainder of the Manual is devoted to recommended safe practices on construction work. Each section deals with a different phase of construction activity, yet all apply to any type of work. This fifth revised edition was compiled and edited by D. A. Buzzell, Manager of the Heavy Construction Div. of Associated General Contractors. The Manuals cost $3.25 each, plus postage, and are available from the Associated General Contractors, 1957 E Street, N.W., Washington 6, D. C.

STANDARD PLANS FOR HIGHWAY BRIDGE SUPERSTRUCTURES

The Bureau of Public Roads has prepared a complete series of standard plans for bridges that are adaptable to both primary and secondary roads in span lengths from 11 to 140 ft., with 24 and 28-ft. roadways. Only a minimum of engineering is required to provide adequate foundation treatment for the abutments and, possibly in some longer bridges, for a central pier. To take advantage of the potential savings in time and money in using standard bridges it will require two actions: 1) Adoption of the standard bridge plans by states, counties and cities and the establishment of the practice of ordering bridges by sizes and



112

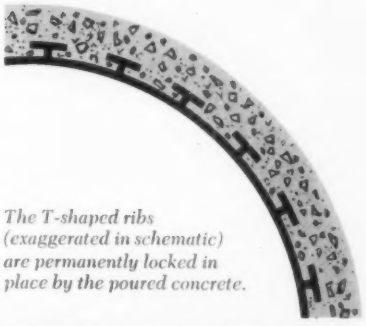
This Sewer will go a Long Way

Not only will this 9½-foot outfall sewer extend eight miles, but it will go a long way in years of trouble-free service. The engineers who designed it say that it will still be functioning perfectly in the year 2000.

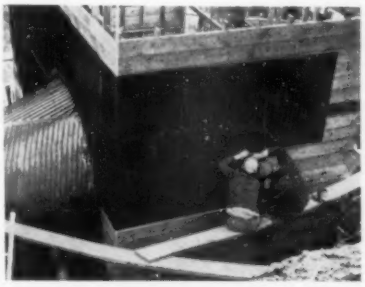
Their confidence is based on wise choice of construction materials. Every joint of pipe, every foot of monolithic tunnel, every structure is built of reinforced concrete to obtain structural strength at low cost. Every surface above the low flow line is completely covered by a continuous membrane of T-Lock Amer-Plate®, the vinyl lining that is impervious to the corrosive action of oxidized hydrogen sulfide *at any level of concentration.*

The engineers know that no one can accurately predict future rates of H_2S gas generation, so they have insured the ultimate life of the concrete by investing an extra 8 to 10% for T-Lock protection. They predict that this "extra" will spare their city the cost of a replacement sewer in about 20 years, and *save the taxpayers millions of dollars!*

Because of obvious and substantial savings such as this, millions of square feet of T-Lock are now in use in progressive municipalities from coast to coast. These include Los Angeles; Topeka; Wichita; Sioux City; Shreveport; Washington, D.C.; San Diego; Mansfield, Ohio; Huntington, W.Va.; Hutchinson, Kan.; and Orange County, Calif. T-Lock Amer-Plate is also on current specifications for many other municipalities. For complete list of users and specifiers, plus technical data and a typical specification, write:



The T-shaped ribs (exaggerated in schematic) are permanently locked in place by the poured concrete.



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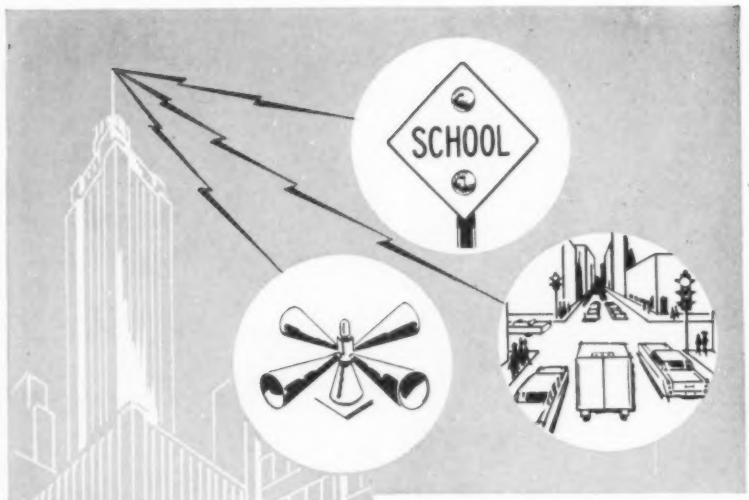

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code numbers; and 2) acceptance by steel companies of the idea and initiation by them of an immediate plan to fabricate and stockpile. Copies of these standard plans are available from the Government Printing Office, Washington 25, D.C., at $1.75 each.

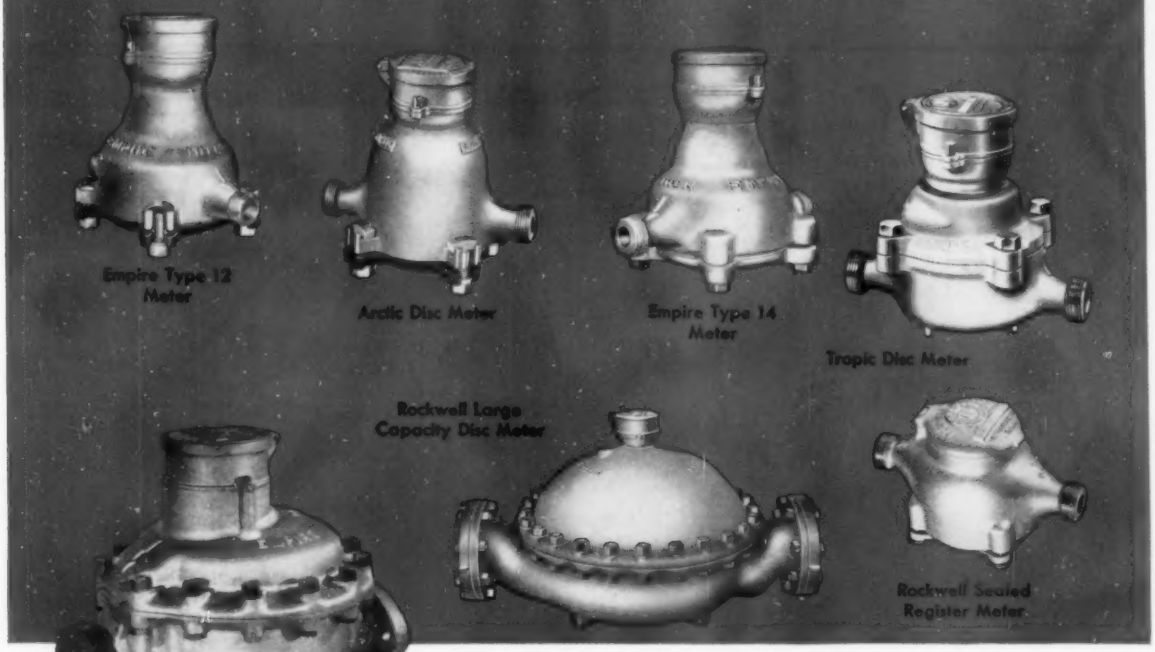
TRAFFIC BEHAVIOR AS RELATED TO SEVERAL HIGHWAY DESIGN FEATURES

This bulletin contains 4 papers on the relationship between traffic behavior and various highway design features, as presented at the 36th Annual Meeting of the Highway Research Board. The first paper, by Charles J. Keese and Robert H. Schleider, correlates design factors and operational characteristics of the Gulf Freeway in Houston, Tex., and the Central Expressway in Dallas. The second paper, by M. D. Shelby and P. R. Tutt, reports the results of vehicle speed and placement surveys in Texas on (a) two-lane rural highways, (b) rural bridges, and (c) an urban grade-separation structure with and without an obstruction on the narrow 6-ft. shoulder. The third paper, by Wesley R. Bellis, reports a New Jersey study of the frequency and character of use of shoulders along state highways, both for leisure and emergency stops. The fourth paper, by Asriel Taragin, reports on a cooperative study by the Bureau of Public Roads and nine western states of driver behavior as related to shoulder type and width on two-lane rural highways. Copies are $1.60 each and are available from Highway Research Board, 2101 Constitution, Washington, D. C.

AIR PHOTO AND SOIL MAPPING METHODS: APPRAISAL AND APPLICATION

This bulletin contains two papers on appraisal and application of air photo and soil mapping methods presented at the 36th annual Meeting of the Highway Research Board, together with a listing of the current USGS activities in geologic mapping throughout the United States and its territories. The first paper, by J. D. Mollard and H. E. Dishaw, summarizes data covering ten years of mapping granular construction materials from aerial photographs. The second paper, by Frank K. Evans, describes the use of soils maps in the operation and planning of the highway facilities of Ingham County, Mich. Copies are available from the Highway Research Board, 2101 Constitution, Washington, D. C., at 80¢ each.

MODERN METERS



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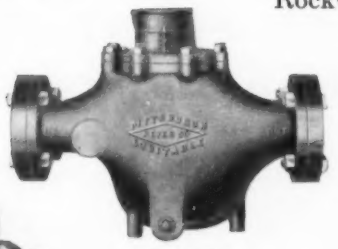
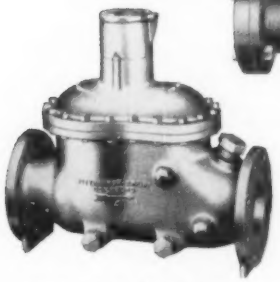


Eureka B
Current Meter



Rockwell Single Register
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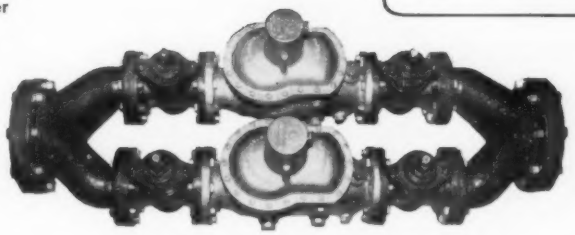

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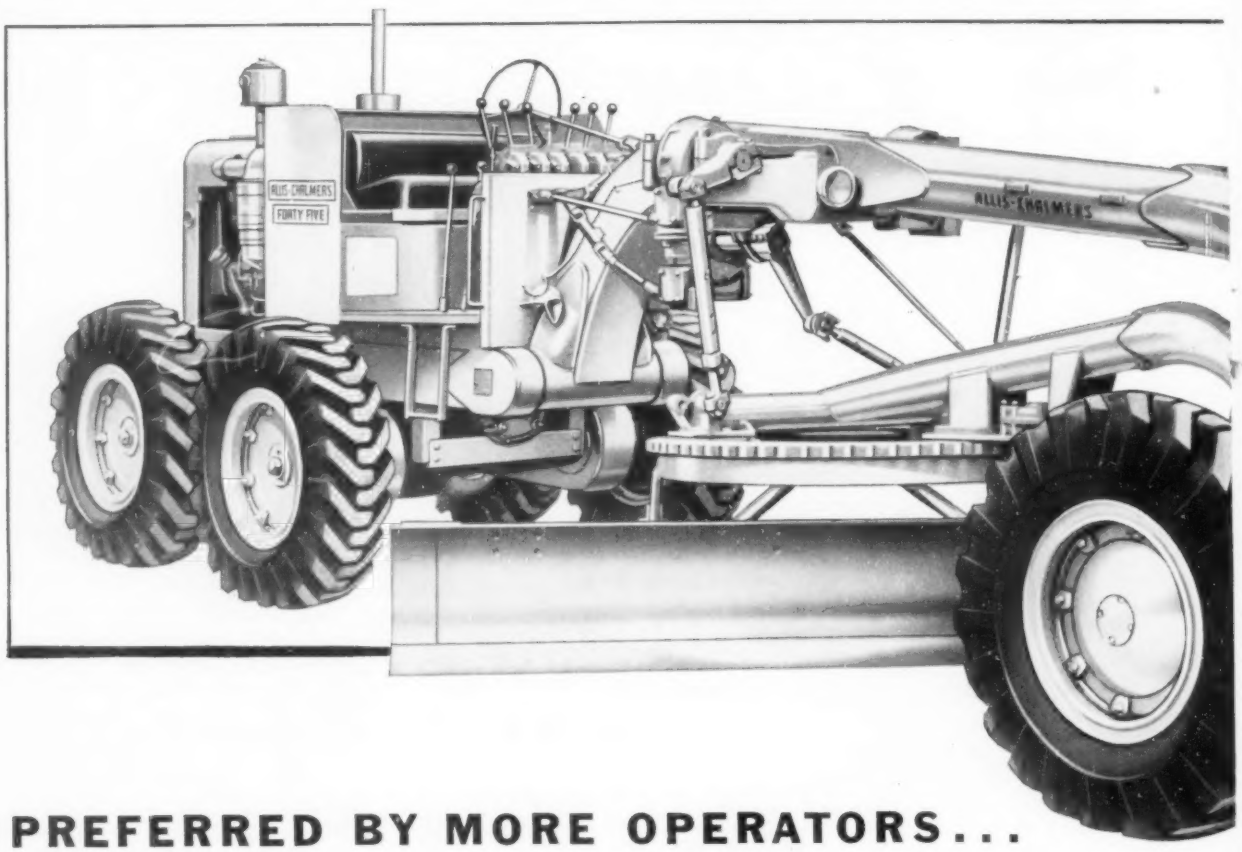
Compound Meter Unit

For consistently tough jobs, compare with any other heavy-duty motor grader



PREFERRED BY MORE OPERATORS... BOUGHT BY MORE USERS EVERY DAY

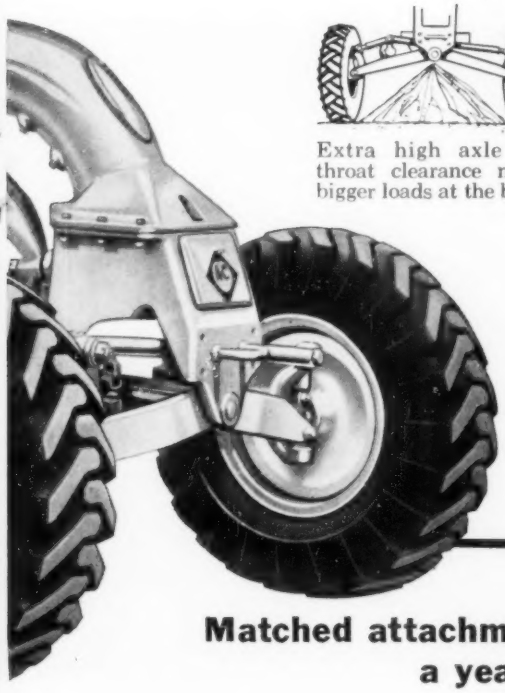
The FORTY FIVE has the power, weight, traction and speeds you need for high-production grading. Superior stability and precision control give you deep precision cuts or smooth finishes. The FORTY FIVE is built to take the shocks and strains of heavy-duty service — and to keep production steady. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

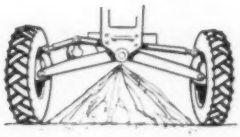
Look ahead... *move ahead* ...and stay ahead with **ALLIS-CHALMERS**

Allis-Chalmers FORTY FIVE performance

- 120 hp
- 6 forward speeds to 20.6 mph
- 3 reverse speeds to 7.0 mph
- 23,800 lb approx.

Advantages that mean more production . . . less maintenance . . . easier and better operation

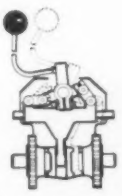




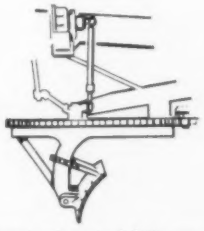
Extra high axle and throat clearance means bigger loads at the blade.

The ROLL-AWAY moldboard rolls dirt, gives more performance per horsepower, more production per gallon.

Fully enclosed power steering — easy control under all conditions.



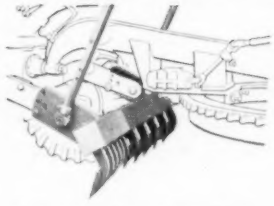
Toggle-type controls are exclusive with Allis-Chalmers.



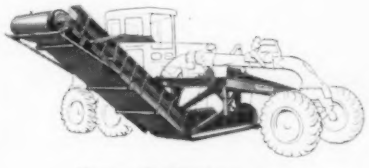
Front-mounted lift cases eliminate long shafts that twist under loads.

Matched attachments and accessories make it a year-round producer

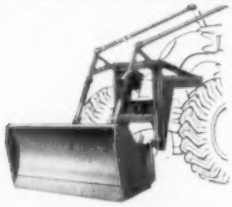
All-steel, stand-up cab



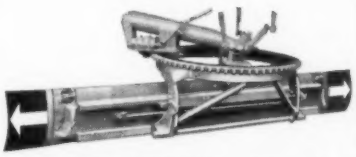
11-tooth, V-type scarifier



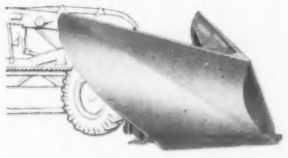
Hancock elevator



8-foot bulldozer



Hydraulic, shiftable moldboard

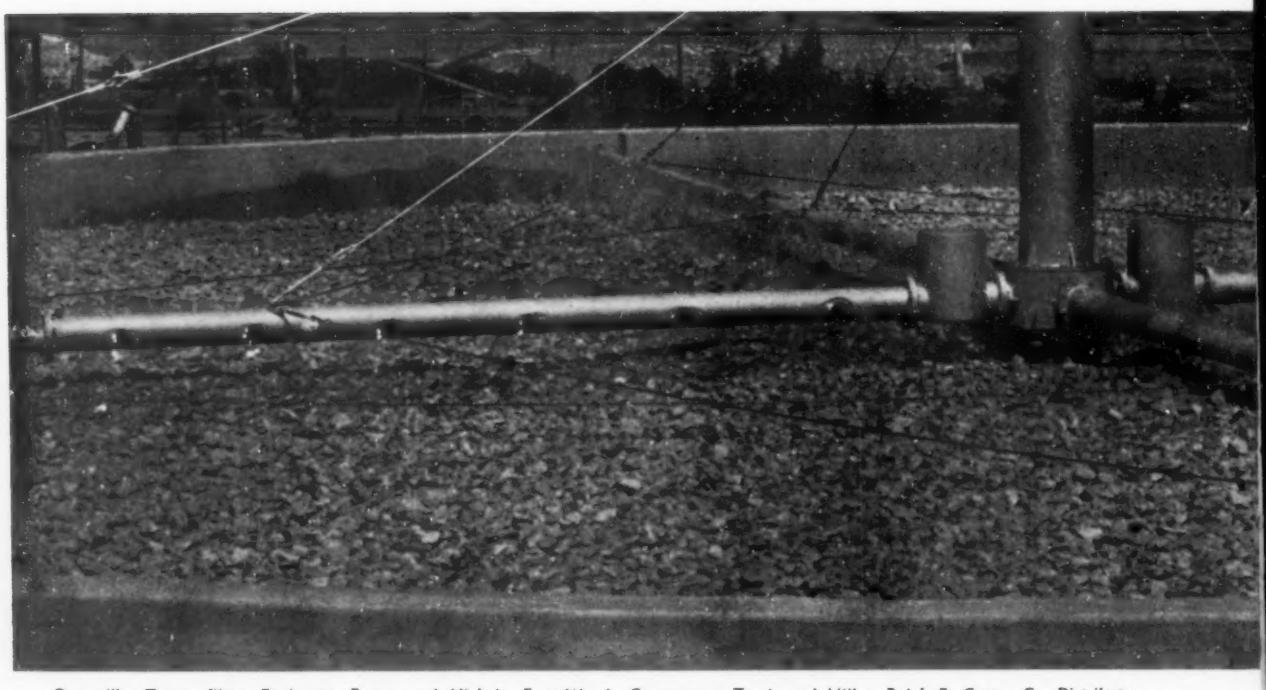


V-type snowplow

ROLL-AWAY is an Allis-Chalmers trademark.

low cost and high efficiency highlight

with



Greenville, Texas, filter. Engineers, Freese and Nichols, Fort Worth. Contractors, Travis and Miller. Ralph B. Carter Co. Distributor.

All over America trickling filters are going in for sewage treatment because of the unique combination of advantages such filters with vitrified clay bottom blocks offer. Clay affords a higher crushing strength, is light weight and easy to lay, in addition to the many exclusive advantages it has over filter floors using substitute materials of any type. These are discussed on the opposite page.

TFF **TRICKLING FILTER**

SYMBOL OF GOOD TREATMENT

MODERN PLANTS

Vitrified clay blocks are superior because they are made in modern plants under rigid controls usually impossible with substitutes.

SPECIFICATIONS

ASTM specifications insure good trickling filter under-drains —insure that you get the best. Ask any member for a copy of approved Specifications ASTM C-159-55.

ADDRESS ANY MEMBER OF THE INSTITUTE FOR FULL DETAILS AND SUGGESTED SPECIFICATIONS FOR BLOCKS

trickling filters

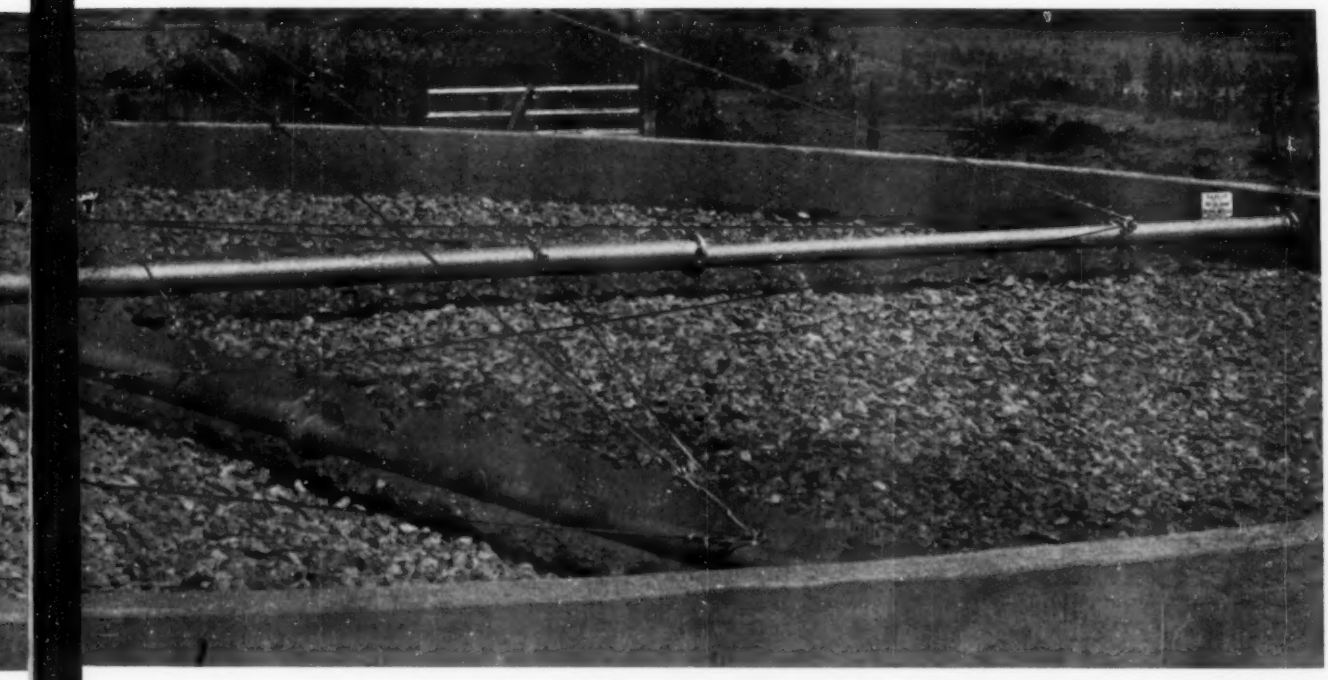
TFFI specification

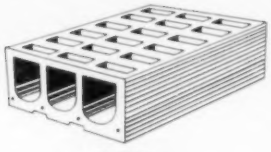
vitrified

clay bottom blocks

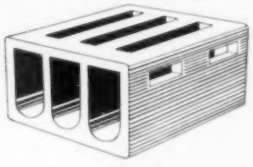
LOW COST For your next sewage treatment plant use Trickling Filters with vitrified clay underdrains. Remember, Trickling Filters have many advantages, starting with low first cost, followed by low operating costs. Others are: simplicity of operation, very long useful life, flexibility, excellent results, top-notch effluent, overloads no problem.

PERMANENCE Since a Trickling Filter can be no better than its underdrain system, it is vital that the floor blocks be of vitrified clay. They guarantee permanence with protection agains acids, alkalis and bacterial action that blocks made from a substitute material cannot possibly give. Ask any member below about our 50-year guarantee of vitrified clay underdrain blocks.

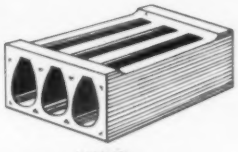




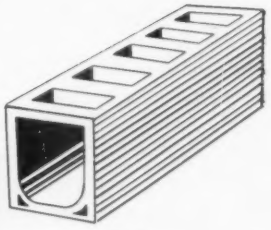
DICKEY
W. S. Dickey Clay Mfg. Co.
Kansas City 6, Mo.



POMONA
Pomona Terra-Cotta Co.
Greensboro, No. Car.

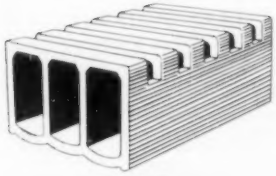


NATCO
Natco Corporation
327 Fifth Ave.
Pittsburgh 22, Pa.

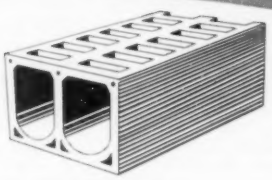


BOSCO
Bowerston Shale Co.
Bowerston, Ohio

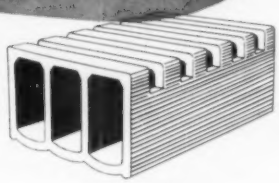
FLOOR INSTITUTE



TRANSLOT
Cannelton Sewer Pipe Co.
Cannelton, Ind.



ARMCRE
Ayer-McCarel Clay Co., Inc.
Brazil, Ind.



TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas

4:30 p.m.

Conditions hazardous

5:15 p.m.

Rush hour traffic moves safely

COLUMBIA CALCIUM CHLORIDE

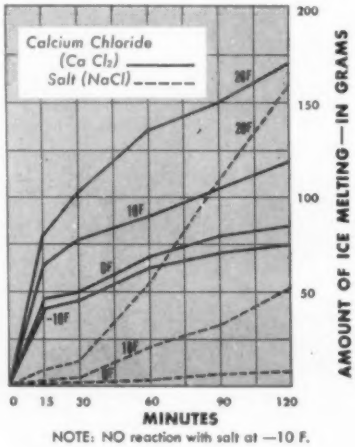
makes streets and roads safe faster

Speedy ice and snow control keeps towns and highways running smoothly, holds fatalities and injuries down. And here are new test results proving once again that Columbia Calcium Chloride brings safety to surfaces *faster*. This skid-proofing chemical melts *8 times as much ice* within thirty minutes after application as is melted by salt. Here are comparative results over a two hour period:

Better order an ample supply of Columbia Calcium Chloride today through your nearest Columbia-Southern District Sales Office.

AMOUNT OF ICE MELTED
15 TO 120 MINUTES

350 Grams ice in 7" by 11" pan
40 Grams chemical (based on 100% NaCl or $CaCl_2$)



NOTE: NO reaction with salt at —10 F.

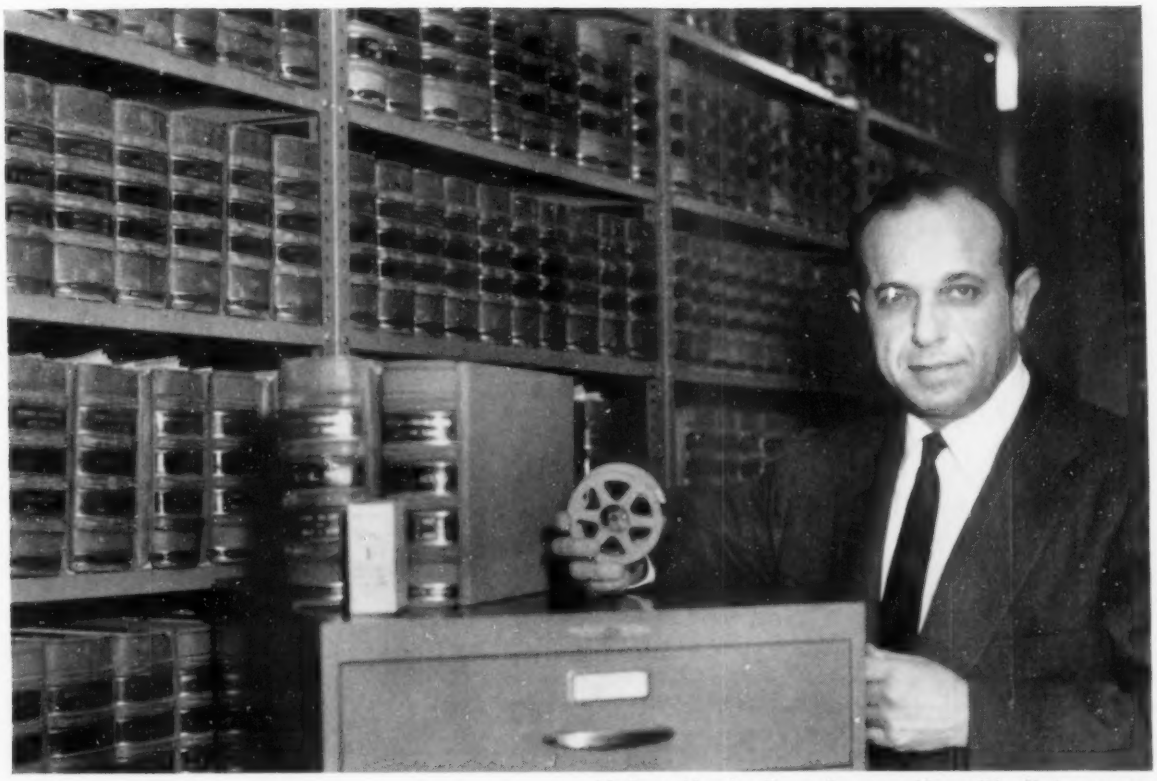
Columbia Calcium Chloride is available in both High Test Flake (94-97% $CaCl_2$ content) and Regular Flake (77-80% $CaCl_2$).

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte Chicago • Cleveland • Boston • New York St Louis • Minneapolis • New Orleans Dallas • Houston • Pittsburgh • Philadelphia San Francisco

IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

Safeguard Winter Traffic with Columbia Calcium Chloride



Mr. Samuel London, Deputy Secretary of State of New York, compares single Recordak Microfilm roll with the two volumes it replaces

Cuts volumes down to size...

$10,000 a year saved by the State of New York with Recordak Microfilming!

ALBANY, N. Y.—bound volumes of corporation records filed with the Division of Corporations in the Office of the Secretary of State are being replaced by Recordak Microfilm files.

This new system not only reduces clerical costs, but saves 98% of space needed for files . . . cuts daily copying costs . . . does away with bookbinding . . . results in a net saving for the State of $10,000 a year!

Now all incoming documents are microfilmed, at a rate of 225,000 pages a year. Some 80,000,000 older records, dating as far back as 1811, are also being microfilmed . . . occupy less than 2% of the space previously used!

A duplicate microfilm copy is used for reference, and the original negative is stored off-the-premises as a security copy.

Agencies large and small can use Recordak Microfilming to advantage. Prices are low. The Recordak Junior Microfilmer, for example, with built-in film reader sells for as little as $550; also available on a low-cost monthly rental plan. Mail coupon today. No obligation whatsoever.

Price quoted subject to change without notice.

RECORDAK

(Subsidiary of Eastman Kodak Company)

originator of modern microfilming—

now in its 31st year

"Recordak" is a trademark

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RECORDAK CORPORATION
415 Madison Avenue, New York 17, N. Y.

Z-11

Gentlemen: Please send me further details on the use of Recordak Microfilming in government agencies.

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Title_____

Agency_____

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City_____ State_____

EQUIPMENT and MATERIALS

FOR YOUR

PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

Corrosion Data Kit on Water Main Fittings

333. Comprehensive data on the problems of corrosion and tuberculation of water distribution systems are available from R. H. Baker and Co., Inc., 2244 E. 37th St., Los Angeles 58, Calif. Check the reply card.

Governors and Speed Switches

340. New style governors and speed switches which have a variety of applications are covered in bulletins from Synchro-Start Products, Inc, 8151 No. Ridgeway Ave., Skokie, Ill. Check the reply card for prices and specifications.

Handbook on Sectional Plate Pipe, Pipe-Arch and Arches for Culverts

487. Description of culvert pipe material, loadings, gage tables, field assembly drawings, details on installation, tables on sizes of pipe available, and dead and live load tables are included in this handbook. Also covered are tables on determining waterway openings in culvert design. Check the reply card or write Republic Steel Culvert Div., 2318—13th St., N. E., Canton 5, Ohio, for this valuable manual.

Power Packer and Sani-Tainer Refuse Collection Methods

350. A 4-page bulletin on the Power Packer refuse collection bodies and the Sani-Tainer refuse containers for municipalities is available from Daybrook Hydraulic Div., Young Spring & Wire Corp., Bowling Green, Ohio. Check the reply card.

Improved Method for Supplying Activated Sludge Process Demands

356. Bulletin No. 7316 describes the development, design and advantages of this improved method for supplying oxygen demands in the activated sludge process. Check the reply card or write Dorr-Oliver Inc., Stamford, Conn., for cutaway wash drawings of typical aerator installations and an activated sludge flowsheet.

Bulletin on Littleford Maintenance Distributors

384. The Spray Chief bituminous distributor for working on secondary roads, driveways and parking lots is described in Bulletin IJ-38 available from Littleford Bros., Inc., 457 E. Pearl St., Cincinnati 2, Ohio. Check the reply card.

Packaged Activated Sludge Plants

408. Packaged sewage treatment plants for small installations utilizing the activated sludge process are covered in Bulletin No. 22579 available from Walker Process Equipment Inc., Aurora, Ill. Check the reply card for design drawings and specifications.

IBM 650 Electronic Computer Used in Highway Engineering

419. This bulletin covers data on horizontal curve bridge computations, monthly equipment summaries, roadway design computations, right-of-way traverses and area computations. Check the reply card or write International Business Machines Corp., 590 Madison Ave., New York 22, N. Y., for your copy.

Laboratory Equipment for Testing of Soils and Construction Materials

420. Literature from the Fred S. Carver Inc., Hydraulic Equipment, One Chatham Road, Summit, N. J., covers test cylinders, hot plates, bearing plates and cloth equipment. Check the reply card.

MORE LISTINGS ON PAGES 34 TO 47

Surface Wash Water Valves for Filters

421. Bulletin W-17 covers the use of G-A control valves and includes operating layouts, operation, construction and dimensions along with complete specifications. Check the reply card or write Golden-Anderson Valve Specialty Co., 1244 Ridge Ave., Pittsburgh 33, Pa., today.

Monotube Poles for Highway Lighting and Signing

432. Highway pole designs, in both steel and aluminum, as well as various overhead sign mounting arrangements are illustrated in Catalog LS-23 available from The Union Metal Mfg. Co., Canton 5, Ohio. Check the reply card for base and bracket details and other specifications.

Bionetic Cleans and Maintains Sewer Lines and Sewage Plants

444. Bionetic digests grease and sludge and eliminates odors and stoppages in sewer lines, sewage plants, septic tanks and cesspools. Check the reply card or write Reliance Chemicals Corp., 12405 Sowden Rd., Houston 24, Tex., for literature.

Screen Pipe For Water Wells

459. An 8-page catalog describing Screen Pipe for water wells along with specifications of the various types made is available from Emsco Screen Pipe Co., P. O. Box 14446, Houston 21, Tex., or by checking the reply card.

Mobile Laboratory for on-the-Site Testing Programs

450. Illustrations showing the latest laboratory layouts and combinations of testing equipment and diagrams and groupings of apparatus needed to perform various ASTM tests are included in Bulletin ML-100 from Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill. Check the reply card.

Manual on Construction Castings

462. This 168-page Manual covers catch basin inlets and traps, building castings, manhole covers and steps, flap valves, wheel guards, drainage grates and many other construction and maintenance castings. Check the reply card or write Neenah Foundry Co., Neenah, Wisc., for your copy.

Catalog on Goulds Centrifugal Pumps

470. Single stage double suction centrifugal pumps are covered in Catalog 721.6 available from Goulds Pumps, Inc., Seneca Falls, N. Y. Check the reply card for specifications, construction details, mechanical data and performance curves.

Data on Sewer Cleaning and Water Main Cleaning Service

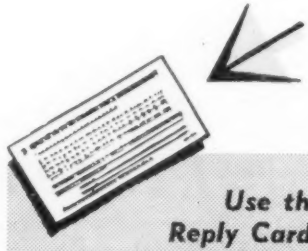
476. Equipment and service available on nation-wide sewer cleaning and water main cleaning service are covered in catalog available from National Power Rodding Corp., 1000 South Western Ave., Chicago 12, Ill. Check the reply card.

Precast Pre-Tensioned Bonded Prestressed Concrete Members

479. The application and production of pre-tensioned bonded members are covered in Bulletin PC-932 available from Construction Materials Div., John A. Roebling's Sons Corp., Trenton 2, N. J. Check the reply card today.

Year Round Concreting

504. A summary of the American Concrete Institute's standard recommendations for cold weather concreting is available from The Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C. Check the reply card for data on how calcium chloride and other developments aid in placing concrete in winter.



Use the Reply Cards For Prompt Service

The Work Bull 1001 as Pick-up Sweeper has 63" Palmyra rotary broom, wire steel gutter brush, and sprinkler system.

Stretch Dollars – Save Manpower with equipment that does more . . .

WORK BULL 1001

WORKS AS A LOADER ONE MINUTE . . . A SWEEPER THE NEXT

GET MORE EFFICIENCY OUT OF ONE MACHINE The Work Bull 1001 solves the "sticky budget" problem for all departments that need to save on equipment costs as well as manpower. This versatile 60.3 h. p. machine can be changed from a 7/8 cu. yard Tractor Loader to a hydraulically controlled Pick-up Street Sweeper in a matter of minutes. It doesn't require another unit to follow it around to pick up the debris, either, because this picks up its own and dumps it right into a truck.

The Work Bull 1001 can also be converted into a Backhoe (with its own backfill blade), Fork Lift, Angle Dozer, Crane, Rotary Broom, and Scarifier – right on the job if necessary. And each performs its task so well that you will think it is intended for just that one purpose.

INSTANT REVERSING WITHOUT SHIFTING To change directions of travel on the Work Bull 1001 simply switch your foot from the forward accelerator pedal to the reverse accelerator pedal. It responds instantly without any shifting of gears or levers. This, plus torque converter, power steering, five-speed transmission in either direction lets you work circles around other machines.

43° ROLLBACK AT GROUND – DIRECT LINE THRUST You get "bull-dozer" action with 5,200 pounds of breakaway in digging . . . high efficiency in stockpiling and loading operations.

LOW PACKAGE PRICE You'll be surprised how little it costs to own a Work Bull 1001. You can buy it with whatever attachments you need for profitable operation. Chances are that you will pay less for the basic unit and all attachments that you would normally pay for just one single-purpose machine.

Other Massey-Ferguson Industrial Power Packages include the Work Bull 202 (40 h. p.) Tractor, Work Bull 303 (54.5 h. p.) Tractor, Work Bull Fork Lift, Davis Loader and Backhoe plus a multitude of integrated attachments for each. For information on the complete line ask for Brochure G-4 or for the Work Bull 1001 . . . Brochure W-1. *Write Massey-Ferguson Industrial Division, 1009 South West Street, Wichita 13N, Kansas.*

Sweeper collects debris into self-contained dust pan; then dumps directly into truck.

Here the Work Bull 1001 is employed by a city in a sewerage treatment plant. Instant reversing, 43° rollback speeds handling.

Side-mounted mower matched to the Work Bull 202 has vibration-free counterbalanced drive.

MASSEY-FERGUSON INDUSTRIAL DIVISION

To order these helpful booklets check the reply card opposite page 34.

NEW LISTINGS (Cont.)

Wood Hogs For Incinerator Plants

510. Units quickly and economically reduce logs and slabs, edgings, bark or other waste wood into chips for fuel. Check the reply card or write Diamond Iron Works, Div. Goodman Mfg. Co., Halsted St. and 48th Place, Chicago 9, Ill., for complete specifications and dimensions.

Sewage Treatment Engineering Data Manual

511. This manual contains a brief outline of the various accepted methods of treating sewage and some of the problems, advantages and disadvantages of each. Check the reply card or write Smith & Loveless, Inc., P. O. Box 8884, Kansas City 15, Mo., for design notes, charts and drawings.

Instrumentation and Equipment for Automation of Process Industries

528. Bulletin 100-R5 contains photographs, operational data and design feature descriptions of twelve varied products for positive control of materials in motion. Write B-I-F Industries, Inc., 345 Harris Ave., Providence, R. I., or check the reply card for data on flow tubes, Venturi tubes and nozzles and telemeters.

Gradall Earth Moving and Construction Machine

532. The multi-purpose Gradall is described in catalog available from the Gradall Div., The Warner & Swasey Co., Cleveland 3, Ohio. Check the reply card for description of machine, applications and specifications.

Dowel Units for Concrete Highways and Airport Paving

538. Type of dowel units available, standard details and assembly plans and joint materials are the sections covered in catalog from Bethlehem Steel Co., Bethlehem, Pa. Check the reply card.

Data on the Hydro E-Z Pack Disposal Body

572. This disposal body has no moving chains, no whirling knives, and has a 76,600 lb. pressure that takes anything and compacts everything. Check the reply card or write Hydro E-Z Pack, Div. of Hercules Galion Products, Inc., Galion, Ohio, for a copy of Bulletin E-100.

Highway Hazard Warning Manual

604. How to use highway torches safely and lanterns effectively are covered in this Manual from R. E. Dietz Co., Syracuse 1, N.Y. Check the reply card for data on recommended traffic control and hazard warning diagrams.

Wain-Roy Backhoes for the Hough Payloaders

632. Literature is available from Wain-Roy Corp., Hubbardston, Mass., on Wain-Roy backhoes for attachment to the Hough Payloaders. Check the reply card for full details.

For Prompt Service Use The Reply Card

Earth Augers and Accessories Used in Construction and Maintenance

633. Augers, shank plates, valves, adapters and boring heads and auger heads are covered in catalog from Petersen Engineering Co., Inc., Santa Clara, Calif. Check the reply card for specifications and price lists.

All About Slip-Sticks In New Bulletin from K & E

635. A Bulletin telling the story of how to select a slide rule has been released by Keuffel & Esser Co., Adams and Third Streets, Hoboken, N.J. Check the reply card for data on the Log Log Duplex Decitrig, the Polyphase and Mannheim types, and pocket rules.

How to Use Chemical Mixtures in Winter Maintenance

636. 3-way highway ice control with Solvay calcium chloride is covered in literature available from Solvay Process Div., Allied Chemical Corp., 61 Broadway, New York 6, N.Y. Check the reply card today.

Chevrolet Trucks for 1959

642. Chevrolet trucks for 1959 feature more models, thriftier engines, stronger cabs and frames, safer brakes and tougher axles and transmissions. Write to the Chevrolet Div., General Motors, Detroit 2, Mich., or check the reply card for complete data on these new trucks.

Construction of Roads and Freeways With Sohio Asphalt

645. Complete information on Sohio asphalt's consistent top quality and the "round-the-clock" service that means delivery day or night is available from Sohio, Asphalt Division, Midland Bldg., Cleveland 15, Ohio. Check the reply card.

Literature on Large Diameter Steel Pipe

649. Pipe for municipal and project water systems, water well casing and pipe piling are covered in literature from Roll-Weld Pipe & Lube, Inc., P.O. Box 1234, Jacksonville, Fla. Check the reply card for pipe sizes, specifications, and lengths.

•

WATER WORKS

Plastic Wash Troughs For Water Treatment

45. Leopold fiberglass-reinforced plastic wash troughs for water treatment are described in literature from F. B. Leopold Co., Zelienople, Pa. Check the reply card for data on these units that will last for years without any painting or other maintenance.

100 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH, Chlorine and Phosphate Control and descriptions of comparators for making colorimetric analyses. A 100 page booklet is available by checking reply card. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

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Exposition of Chemical Industries
New York City, N. Y., Dec. 2-6

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Miami Beach, Fla., Feb. 2-6, 1959

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College Station, Tex., Mar. 1-6, 1959

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Atlantic City, N. J., Mar. 10-13, 1959

American Water Works Ass'n. California Section, AWWA
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Seattle, Wash., Sept. 20-23, 1959

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Sept. 20-23, 1959

Federation of Sewage and Industrial Wastes Ass'ns.
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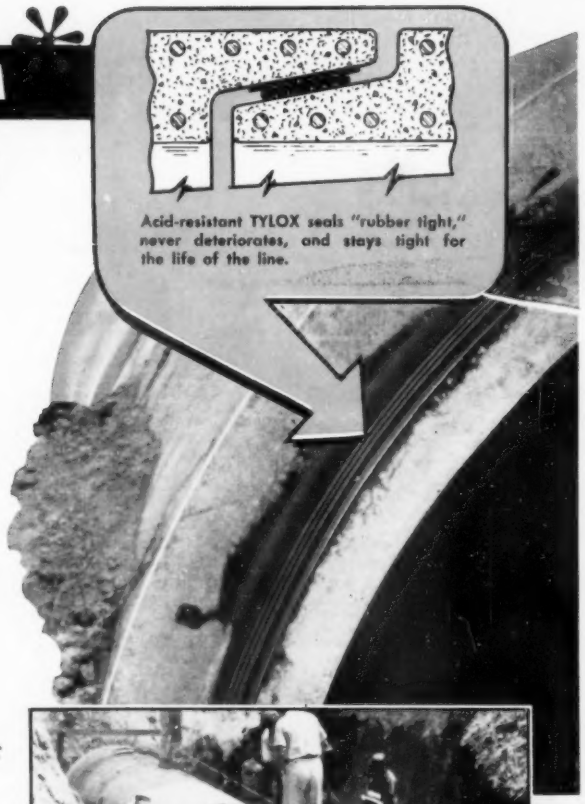

Make water-tight joints . . . speed pipe-laying in spite of tough working conditions

Gumbo! . . . wet, sticky and unstable . . . that's what faced contractors installing Baton Rouge's Longwood Drive Outfall Sewer. And the trench for the line was more like a canyon than a sewer ditch.

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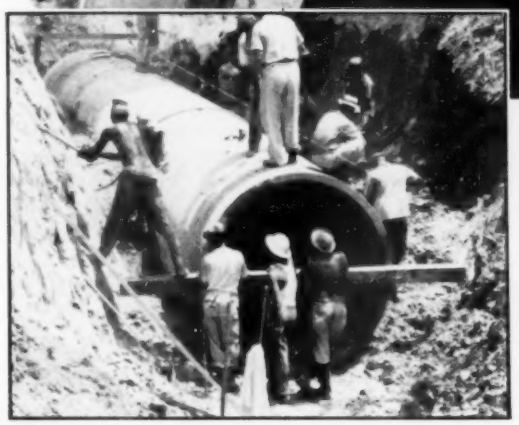

PROJECT: Longwood Drive Outfall Storm Sewer for City of Baton Rouge, La.

ENGINEERS: Edward E. Evans, Consulting Engineer, Baton Rouge, La., and Ray W. Burgess, Director of Public Works, Baton Rouge, La.

CONTRACTOR: J. H. Jenkins, Contractors, Inc., Baton Rouge, La.

PIPE: 72" T & G Reinforced Concrete Pipe with TYLOX Rubber Gaskets, manufactured by Anderson-Dunham, Inc., Baton Rouge, La.

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Brochure contains engineering data and illustrated case histories showing why engineers the world over specify TYLOX get long-lasting, leak-proof pipe lines at less cost.

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To order these helpful booklets check the reply card opposite page 34.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American Water meters described in Bulletin No. 56 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Check the reply card.

Engineering Data on Screening Equipment

77. Water, sewage and industrial waste screening equipment is fully described in a 28-page book, No. 2587, offered by Link-Belt Co., Colmar, Pa. Complete data for the engineer and tables to determine the proper size unit for handling various capacities are included. This valuable comprehensive booklet may be obtained by checking the reply card.

Manual on Instrument Accessories and Supplies

96. The 60-page loose-leaf book, Catalog 500, includes specifications, part numbers and prices for more than 250 commonly furnished instrument parts and supplies. It is divided into 5 sections: Mechanical; pneumatic; electric-electronic, general, and tools and service. Check the reply card or write The Foxboro Co., Foxboro, Mass., for your copy.

Information on Service, Valve, Roadway and Meter Boxes

122. Literature on specifications covering "Buffalo" service, valve, roadway and meter boxes, and adjustable valve boxes for water and gas has just been released from Buffalo Pipe & Foundry Corp, Box 55-Station B, Buffalo 7, N. Y. Check the reply card for your information on these valve boxes.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking reply card.

Helpful Reference Catalog on Waterworks Gate Valves

146. All necessary details on Double Disc Parallel Seat Gate Valves for waterworks use are provided in the attractive 36-page bulletin issued by Ludlow Valve Mfg. Co., Inc., Troy, N. Y. Conveniently arranged design data shows all dimensions for 2" to 60" valves. Gearing, floor stands, operating devices are covered too. Get Bulletin 54W by checking the reply card.

Engineering Data On Gravity Filter Design

170. The complete line of gravity filters and related accessories furnished by the Permutit Co., a Division of Pfaudler-Permutit, Inc., New York 36, N. Y., is covered in a well-illustrated 24-page booklet. Each element of a filter and filter controls are discussed in detail to assist the designer of these important units.

Submersible Pumps For Municipal Use

185. A new 12-page bulletin that describes the line of BJ submersible pumps is available from Byron Jackson Pump Inc., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif. Construction and operation of the pumps are covered along with a handy selection chart that gives capacity and head performance.

Design of Prestressed Concrete Tanks

194. An 8-page technical Bulletin, T-19, on the Design of Prestressed Concrete Tanks, gives engineering data and formulas of general interest to anyone considering prestressed concrete for storage tanks. Check the reply card or write The Preload Co., Inc., 21 East 37th St., New York 16, N. Y.

Catalog on Dewatering Pumps

226. Centrifugal and diaphragm pumps for dewatering jobs are described in Catalog DP7 from The Jaeger Machine Co., 550 West Spring St., Columbus 16, O. Models, specifications and performance tables are included. Check the reply card.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Manual on Pipe Finding Techniques

213. A manual on special pipe finding and leak detecting techniques of interest to utilities, municipalities, oil and gas companies is announced by Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif. The manual contains a number of articles on locating buried pipes and cables and detecting and locating fluid leaks in pipe lines.

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Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. The larger model is available with air power unit to eliminate manual pushing. Get full details by checking the reply card. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

Review of Diatomite Filtration of Water

285. A detailed review of the application of diatomite in the general field of water filtration, including uses in municipal supply and swimming pools is contained in a well-prepared 16-page bulletin. Specific applications to certain water treatment problems are also discussed. Write to the Dicalite Department, 612 So. Flower St., Los Angeles 17, Calif. for Bulletin BW-13 entitled, "Diatomite Filtration of Potable Water," or check the reply card.

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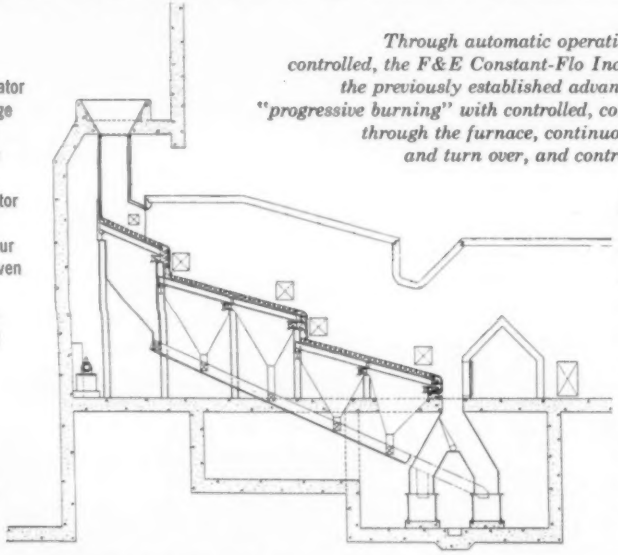

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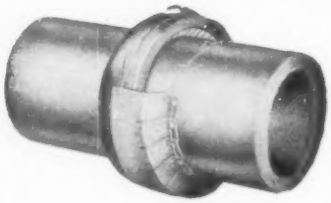

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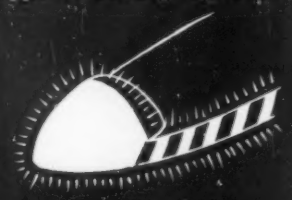

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A Short Course In Pipe Jointing

169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods; photos showing jobs where Tylox gaskets met the need for easily assembled permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the reply card.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check reply card for your copy.

Manual Valves Made Automatic By Tork-Master

310. Tork-Master makes manual valves automatic and it converts a manual operation to an automatic operation without removing valves during changeover. For full data write General Controls, Glendale, Calif., or check the reply card.

Quick Review of Water Meters

316. A helpful condensed catalog which covers sizes and types of water meters for every kind of service is available from Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. Each type is illustrated and fully described; specifications and prices are included. Get Bulletin W-800 by checking the reply card.

Automatic Drilling Machine For Cutting Any Type of Pipe

325. The CL-12 drilling machine may be hand or power operated and will make cuts from 2 to 12 inches through any type of pipe. Check the reply card for full details or write the Mueller Co., Decatur, Ill.

Manual on the Hersey Disc Water Meter

329. Illustrations, descriptions and specifications of Hersey water meters are covered in manual available from Hersey Mfg. Co., 250 Elm St., Dedham, Mass. Size ranges are ⅝"-⅝"x¾"-¾" and 1". Check the reply card.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa.

Testing Water Meters

353. This 40-page catalog is a discussion of fundamentals and a guide to sound practice in meter maintenance. It covers standard specifications of meter accuracy, descriptions of the latest developments in meter testing equipment and many drawings and diagrams. For your copy write The Ford Meter Box Co., Inc., Wabash, Indiana, or check the reply card.

Diesel Engines For Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Red Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Check the reply card.

Cleaning and Relining Water Pipe the Easy Way

397. Complete facilities for relining cast iron or steel water pipelines in place from 4" to 144" in diameter, with the Spunline (TM), Tate and Centriline Processes offered by Pipe Linings, 2414 E. 223rd St., Wilmington, Calif. For full information on cleaning and relining pipe with only momentary interruption of service, check the reply card.

International 6-Cylinder Carbureted Power Units

398. A graphically-illustrated 12-page catalog CR-511-G, on IHC 6 new 6-cylinder power units is available. Power and fuel consumption curves and cutaway views of component parts of the units are covered. Check the reply card or write Construction Equipment Div., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., for specifications.

What You Should Know About Venturi Tubes and Nozzles

400. A comprehensive bulletin, No. 100, of interest to all engineers dealing with the measurement of liquid flow and its various ramifications has been issued by Simplex Valve & Meter Company, Lancaster, Pa. Data on advantages, construction and installation details, range of sizes and specifications are given in simplified form.

Helpful Engineering Data on Cast Iron Pipe

422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long.

V-Notch Chlorinator For Chlorine Flow Control

502. An 8-page catalog on the W & T Series A-721 chlorinator is available from Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J. Chlorinator is adaptable to any type of chlorinator control and feed rate may be controlled manually or automatically.

For Prompt Service Use The Reply Card

Plastic Pipe For Liquids and Gases

514. Kraloy rigid polyvinyl chloride plastic pipe can be used for liquids and gases and will not rust, rot or corrode. Write to Kraloy Plastic Pipe Co., 4720 E. Washington Blvd., Los Angeles, Calif., or check the reply card for complete details on this lightweight pipe.

Bulletin Helps Specify A.W.W.A., Gate Valves

547. Double disc gate valves in 2" to 60" sizes are fully described in a 16-page bulletin which gives details on valve parts, design, materials, application of the "O" Ring Seal, operation and operating devices, directions for ordering valves and parts, dimensions of all sizes, and descriptions of eleven different methods for end connections. Valves for horizontal operation, square bottom valves, many types of gearing and gear cases, and a complete listing of special controls available are included. Get Bulletin A from Rensselaer Valve Co., Troy, N. Y. by checking the reply card.

Modern Elevated Water Tanks

566. A 16-page bulletin describing 2 types of water storage tanks, the watersphere and the waterspheroid, is available from the Chicago Bridge & Iron Co., 332 South Michigan Ave., Chicago 4, Ill. Standard sizes from 25,000 gals. to 500,000 gals. are covered.

Turn Your Water Meter Reading Inside-Out

671. The Visi-Meter is a remote recording and indicator system that eliminates the need of entering the home to read water meters. It records within an accuracy of 0.1 percent. Check the reply card or write Visi-Meter, Inc., 301 North 17th St., Kansas City, Kans., for literature.

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750,000 gallon tank on 120 ft tower.
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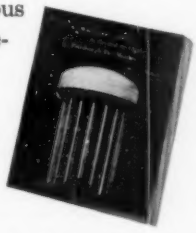

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SEATTLE (1).....Suite 350, 500 Wall St.
SANTA CLARA, CAL.....649 Alviso Road
DENVER (2), 323 Railway Exchange Bldg.

To order these helpful booklets check the reply card opposite page 34.

Filter Sands and Under Drain Gravels

614. Filter sands and gravels for municipal water plants are described in literature available from Eau Claire Sand & Gravel Co., Eau Claire, Wis. Check the reply card for data on sizes available, silica content and content of magnesium, calcium carbonates and iron oxides.

Electronic Locators for Water Mains, Services, Valves and Boxes

677. Miniaturized line locator that is encased in a molded glass fibre container and has transistors that have a rated life of 70,000 hours is described in literature from Wilkinson Products Co., 3987 Chevy Chase Drive, Pasadena 3, Calif. Check the reply card.

Flexible Plastic Pipe For Water Distribution

708. A new-type polyethylene resin flexible pipe is described in Catalog No. 401 available from Orangeburg Mfg. Co., Inc., 375 Park Ave., New York 22, N. Y. Fittings, installation, size and weight tables and physical properties are several of the sections covered.

Comprehensive Bulletin on Zeolite Water Softeners

762. Bulletin WC-108 describes Graver zeolite water softeners for municipal water plants, swimming pools and military bases. Check the reply card or write Graver Water Conditioning Co., Division of Union Tank Car Co., Inc., 216 E. 14th St., New York, N Y.,

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SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N.J. Check the reply card and we will forward your request.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass. Check the reply card.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Buckets and Grapples For Incinerator Service

110. Bulletin provides comprehensive information on the 5 sizes of 2-line, lever arm, clamshell-type buckets; standard 2-line, tine-type grapples; equalizer arrangements and certain incinerator buckets for single drum hoists. Check the reply card or write Blaw-Knox Co., 300 Sixth Ave., Pittsburgh, Pa., today.

Packaged Underground Lift Station

124. Selection tables and detailed drawings of packaged underground lift stations with "Flush Kleen" sewage pumps are available in literature from Chicago Pump Co., 622 Diversey Parkway, Chicago 4, Ill. Check the reply card today.

Protective Lining for Concrete Pipe and Structures

131. T-Lock Amer-Plate is a tough, long-lasting acid-resistant vinyl sheet lining for concrete pipe and structures which are exposed to corrosive materials. T-shaped ribs pressed in the sheet are embedded in the concrete as it is poured to lock the lining permanently in place. Get full details from Amercoat Corp., South Gate, Calif., or check the reply card for illustrated folder.

Manual on Sewer Structures

178. This is a 48-page manual on installation design, reference data and graphs showing discharge of pipe based on Manning's formulas. Also such subjects as structural durability, material durability; selection of structures; factors influencing capacity; joints and fittings; and linings for failing sewers are covered. Copies of Manual CMS-7456 are available from the Product Information Service, Armco Drainage & Metal Products, Inc., Middletown, Ohio, or by checking the reply card.

Catalog on the Flynn and Emrich Incinerator Stokers

180. This catalog describes the Flynn and Emrich Incinerator stokers as to design, feeding capacities and loadings. Plenty of drawings of the stokers and photographs of incinerator plants under construction and in operation are included. Also, there is a good section on the incinerator history. Check reply card for catalog No. 1702 from Flynn and Emrich Co., Holiday and Saratoga Sts., Baltimore 2, Md.

Engineering Data Manual on Underground Lift Stations

218. This 100 page manual includes descriptive bulletins, specifications covering typical installations for pump type or ejector type stations, friction loss tables covering capacities and size of pipe, pump and motor selection charts and wiring diagrams. Check the reply card or write Smith & Loveless, Inc., Water and Sewage Equipment, P. O. Box 8884, Kansas City, Mo.

Valuable Information on Underground Pumping Stations

246. The complete prefabricated underground pumping station is fully described in a bulletin just released by Zimmer & Francescon, 1715 Fifteenth Street Place, Moline, Ill. Construction features, corrosion control, electric controls, specifications, pumping equipment and installation are a few of the items covered Check the reply card.

Literature on Concrete Sewers

270. Literature on concrete sewers is available from Portland Cement Association, Dept. 10-89, 33 West Grand Ave., Chicago 10, Ill. Check the reply card for data on concrete for all modern pipelines.

Chapman Standard Sluice Gates

276. Manual, hydraulic or electric motor control sluice gates are described fully in Catalog 25 available from The Chapman Valve Mfg. Co., Indian Orchard, Mass. These valves are easy to replace and are fitted without alterations. Check the reply card.

Waste Receptacle Designed For Efficient and Economical Sanitation

345. This waste receptacle is readily attached to any post or wall and can be used in streets, parks and public buildings. Check the reply card or write Vega Industries, Inc., Syracuse 5, N. Y., for complete literature.

Modern Methods and Materials For Jointing Sewer Pipe

402. In a compilation of reprints and related supplementary material, the Atlas Mineral Products Co., Mertztown, Pa., presents a comprehensive review of all types of sewer jointing materials and methods. You will find this interesting and informative reading.

ALA. G.C.Phillips Tractor, Birmingham, Prichard
ALASKA The Carrington Co., Seattle, Wash.
ARIZONA Equipment Sales Co., Phoenix
ARK. Clark Equipment Co., Little Rock.
Tri-State Eqpt. Co., Memphis, (Tenn.)
CALIF. Brown-Bevis Ind. Eqpt. Co., Los Angeles
Standard Mach. Co., San Francisco
COLO. H. W. Moore Eqpt. Co., Denver, Gr. Jct.
CONN. Eastern Eqpt. Sales Inc., West Haven
DEL. Ransome Corp., Bear
FLA. Square Deal Mach. & Sup. Co., Inc., Orlando
Squre Deal Mach. of Miami, Miami
Square Deal Mach., Inc., Jacksonville
G. C. Phillips Tractor, Birmingham (Ala.)
GA. Stith Eqpt. Co., Atlanta
IDAHO Feenaughty Mach. Co., Boise
Rocky Mt. Machinery, Salt Lake City (Utah)
ILL. Illinois Cont. Mach. Inc., Elmhurst, Peoria, Rock Island
Koste Machinery Co., Robertson (Mo.)
IND. Reid-Holcomb Co., Indianapolis, Evansville
Illinois Cont. Mach., Elmhurst (Ill.)
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Vivian Eqpt. Co., Ames
Mo. Valley Mach. Co., Omaha (Nebr.)
KANS. G. W. Van Keppel Co., Kans. City (Mo.)
KY. Williams Tractor Co., Louisville, Paducah
Rish Eqpt. Co., Cincinnati and Portsmouth (Ohio)
LA. General Eqpt. Co., Baton Rouge
ME. Eastern Tractor & Eqpt. Co., Portland
MD. Rish Eqpt. Co., Clarksburg (West Va.)
Ransome Corp., Bear (Del.) and Philadelphia (Pa.)
MASS. Perkins Mach. Co., Needham Heights, Springfield
MICH. Earle Eqpt. Co., Detroit, Grand Rapids
Drott Tractor Co., Inc., Iron River
MINN. Wm. H. Ziegler Co., Minneapolis, Hibbing, Crookston, Duluth
MISS. Equipment Inc., Jackson
Tri-State Eqpt. Co., Memphis (Tenn.)
MO. Koste Mach. Co., Inc., Robertson
G. W. Van Keppel Co., Kansas City
Tri-State Eqpt. Co., Memphis (Tenn.)
MONT. Pioneer Eqpt. & Sup. Co., Butte
NEBR. Mo. Valley Mach. Co., Omaha
Nebr. Mach. Co., No. Platte, Scottsbluff
Lincoln Eqpt. Co., Lincoln
NEV. Sierra Mach. Co., Inc., Reno
N. H. Mingolla Mach. Co., Concord
N. J. Dale & Rankin, Inc., Hanover
Ransome Corp., Bear (Del.) and Philadelphia (Pa.)
N. MEX. N. C. Ribble Co., Albuquerque
Equipment Supply Co., El Paso (Tex.)
N. Y. J. C. Georg Const. Eqpt. Co., Syracuse, Schenectady, Lisbon
P-D Service, Inc., Pavilion, Buffalo
H. O. Penn Mach. Co., Inc., New York, Poughkeepsie, Westbury (L. I.)
NO. CAR. H. B. Owsley & Son, Inc., Charlotte
NO. DAK. Northwestern Eqpt., Inc., Fargo, Minot
OHIO Rish Equipment Co., Cincinnati, Cleveland, Columbus, Dayton, Portsmouth, Toledo, Youngstown, Parkersburg, (W. VA.)
OKLA. Leland Eqpt. Co., Tulsa, Oklahoma City
ORE. Feenaughty Mach. Co., Portland
PENN. Watson Eqpt. Co., Inc., Pittsburgh
Ransome Corp., Philadelphia
R. I. Perkins Mach. Co., Needham Heights, Springfield (Mass.)
SO. CAR. Ray Long Eqpt. Inc., Columbia
SO. DAK. Sioux Road, Inc., Sioux Falls, Rapid City
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TEX. J. W. Bartholow Mach. Co., Dallas
Conley-Lott Mach. Co., Lubbock
Equipment Supply Co., Inc., El Paso
UTAH Rocky Mt. Mach. Co., Salt Lake City
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Ransome Corp., Bear (Del.) and Philadelphia (Pa.)
WASH. Feenaughty Mach. Co., Seattle, Spokane
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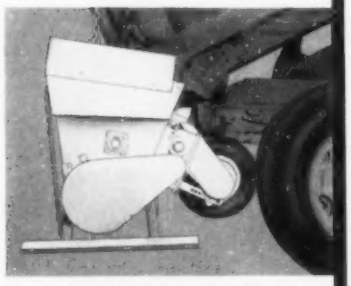
With grooved roller for blanket pattern.

With spiral roller for echelon spread.

Fast, Simple Operation!

In road-traveling position the Model J is up and out of the way.



In less than five minutes the driver can have the Model J locked into position. As dump body is raised, the traction tire comes in contact with the inside truck dual, putting the drive into motion. (Permits tire chains to be placed on the outside dual without interference.) Operates at speeds up to 30 mph.

Whether For Ice Control or Seal Coating HI-WAY Model J Tailgate Spreader Is Geared To Surface of The Road!

- **Attaches to any standard dump truck**
- **Strictly one-man operation**
- **Spreads all granular materials . . . wet or dry**
- **Full 9 foot width**

When ice conditions are bad, more sand, salt or cinders should be applied to the surface of the road. Since the Model J Spreader drive is positively synchronized to the speed of your rear traction tires, you merely adjust the feedgate to lay more material and regulate truck speed to road conditions.

The echelon pattern for ice control mechanically duplicates hand shoveling by laying materials in ridges that more quickly melt the ice. Other units spread a thin blanket that is easily blown off the road by traffic or wind. HI-WAY Model J, pioneer of the echelon spreading pattern, thus enables you to do a more effective job with less material.

For seal coating, depth of coverage is similarly controlled by a feedgate and there is no wasteful free flow when truck is stopped. The dump body operates independently since the unit is hinged directly to the truck frame, *not* to the dump body. An optional block-off attachment adjusts width of spread up to 9 feet. Forward and reverse transmissions also available.

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606 D. Ave. N. W. **Cedar Rapids, Iowa**

To order these helpful booklets check the reply card opposite page 34.

Vitrified Clay Floor System For Trickling Filters

452. The IMCO two unit floor is noted for its mechanical strength, simplicity of construction and large percentage openings for aeration. The units are self spacing and easily set in place. Check the reply card or write Industrial Materials Co., Somerset St. and Trenton Ave., Philadelphia 34, Pa., for complete catalog.

Torque-Flow Sewage Pump For All Phases of Sewage Treatment

496. Bulletin No. P10-B26 describes the operation of the Wemco torque-flow sewage pump and covers typical installation set-ups. Check the reply card or write Western Machinery Co., 650 Fifth St., San Francisco, Calif., for complete details.

Lining of Building Stacks in the Operation of Incinerators

555. Monolithic linings for full protection of stacks and breechings are covered in literature from Plibrico Co., 1800 Kingsbury St., Chicago 14, Ill. Illustrations picture and briefly describe typical installations. Check the reply card.

Use The Reply Card

Root and Fungus Control in Sanitary Sewers and Storm Drains

597. This 24-page bulletin covers the use of copper sulfate for root and fungus control in sanitary sewers and storm drains. Check the reply card or write Phelps Dodge Refining Corp., 300 Park Ave., New York, N. Y., for this helpful guide.

Press-Seal Rubber Gaskets to Seal Joints of Concrete Pipe Sewers

573. Rubber gaskets for sealing the joints of concrete sewer pipe are described fully in literature available from Press-Seal Corp., P. O. Box 482, Fort Wayne, Ind. Check the reply card for information on how these gaskets prevent water infiltration in sewer lines.

CONSTRUCTION EQUIPMENT AND MATERIALS

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, and is available from Reed Mfg. Co., Erie, Pa. Check the reply card.

Inexpensive Ditcher Handles Heavy Diggings

91. The Shawnee Scout Ditcher, a heavier model for extensive digging, has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kansas

Utility Tractors For Many Jobs

94. A pictorial review of the Allis-Chalmers D-Series utility tractor line is available from Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, Wisc. Check the reply card for specifications and dimensions of the D-14 and D-17 tractors.

Booklet Shows Design of Pre-Engineered Steel Buildings

271. Pre-engineered Butler steel buildings are available in every size, type and design to meet your buildings needs. In a helpful 16-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Write to Butler Mfg. Co., Kansas City, Mo.

Drilling Machine For Concrete

221. The Truco diamond drilling machine is described in literature available from Truco Swivel Div., Wheel Trueing Tool Co., 15-3200 W. Davison Ave., Detroit 38, Mich. Unit will cut reinforced or plain concrete. Check the reply card.

Diesel Crawler Tractor With Power-Turn Steering

305. The OC-12 Oliver crawler tractor with 53 drawbar hp, and an inside turning radius of 25 ins. is covered in 16-page bulletin from The Oliver Corp., 400 West Madison St., Chicago 6, Ill. Check the reply card.

Davis Back-Hoe and Davis Loader

312. Literature is available from Massey-Ferguson Industrial Division, Massey-Harris-Ferguson, Inc., 1009 S. West St., Wichita, Kans., describing the new Davis backhoe and Davis loader. The back-hoe can dig at right angles and to a depth of 13 ft. and detaches in 5 minutes. Both units are available for most popular makes of tractors.

Complete Bulletin On Municipal Supplies

473. Everything from leak locators to street signs is listed in the big 100 page bulletin "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included. Get your copy of Bulletin No. 155 from W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill., by checking the reply card.

Principles of "BatchOmatic" Plants Explained

527. The unique principles of simultaneous and fully automatic aggregate and bitumen measuring followed on Barber-Greene's 2,000, 4,000 and 6,000 lb. "BatchOmatic" bituminous batch plants are explained with cut away drawings, charts and other illustrations in a 3-color bulletin offered by Barber-Greene Co., Aurora, Ill. Check the reply card.

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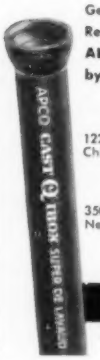

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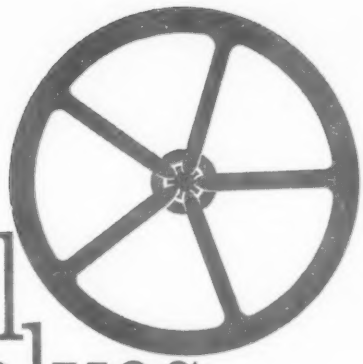

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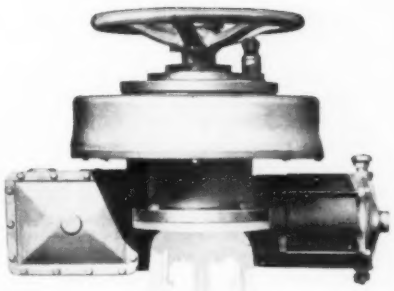

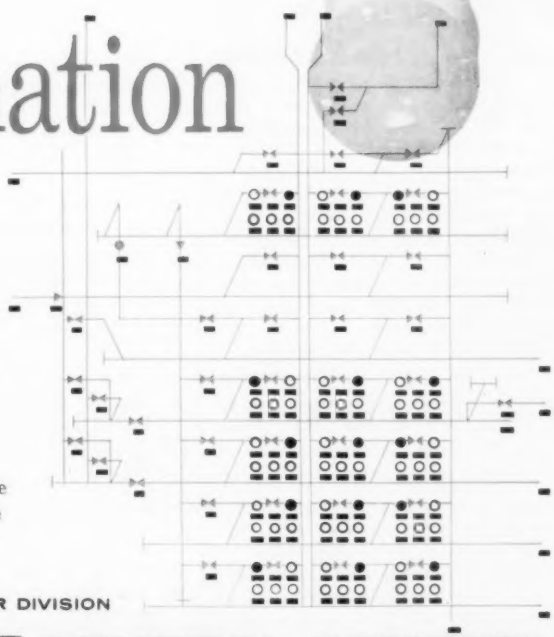

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Today's Modern Water Tanks Prestressed Concrete Type

Long and Short Term Economies Making Them Popular

A modern prestressed concrete tank is not only economical in first cost, but because of its almost maintenance free character, offers any municipality real long term economy. Any tankage engineering study should include calculated maintenance costs over the estimated life of the facility. Average yearly maintenance on a 3,000,000 gallon steel tank is estimated at $2500 per year at current prices. For a prestressed concrete tank, maintenance is negligible; however, occasional painting for color effect may be desired.

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The prestressed concrete tank is also a good looking tank . . . it is inherently strong and extremely stable . . . it is designed and built for permanence. And, 75% of the contract price is spent right in your local community . . . construction is done with materials and labor available locally.

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THE PRELOAD COMPANY, INC.
Jefferson Tower Bldg., 351 Jefferson, Dallas, Tex.

THE CANADA GUNITE COMPANY, LTD.
7325 Decarie Boulevard, Montreal 16, Canada

Design Manual on Complete Structural Systems

100. Manual contains technical information relative to Stran-Steels line of joists, studs, channels, ribbed decking and metal curtain walls. It is well illustrated and contains several pages of loading tables. For this valuable Manual write Stran-Steel Corp., Detroit 29, Mich., or check the reply card today.

Tractor-Shovels With Drott "Four-In-One" Attachment

352. Hough rubber-tired front-end loaders come equipped with the Drott "4-in-1" bucket. Check the reply card or write The Frank G. Hough Co., Libertyville, Ill., for literature on how to use this unit as a shovel, clamshell, scraper and bulldozer.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication.

Tractors and Equipment for Municipal Use

407. Specification sheets for the John Deere crawler and utility wheel tractors; also equipment for loading, dozing, mowing, sweeping and many other operations. John Deere, Industrial Division, Moline, Ill. Check the reply card. State type of tractor and equipment.

Slide Rule PS1 Calculator For Concrete

713. A new pocket size slide rule calculator for the testing of concrete in compression is available from Forney's Inc., P.O. Box 310, New Castle, Pa. It is designed to convert instantly the pressure applied to concrete cylinders and blocks into psi.

STREETS AND HIGHWAYS

How to Prepare and Maintain Roadways With Calcium Chloride

65. "The Calcium Chloride Road," is the name of a new 24-page two-color catalog issued by the Columbia-Southern Chemical Corp., 632 Fort Duquesne Blvd., Pittsburgh 22. Pa. Included are sections on dust control, gradation, placing and mixing materials and shaping. General information on spring, summer and fall maintenance is also provided. Check the handy reply card.

Self-Propelled, One Man Operated Hydra-Hammer

85. This unit breaks concrete pavement, tamps backfill, tamps rock or heavy aggregate, cuts asphalt, compacts blacktop patches and drives highway guard rail posts. Check the reply card or write Ottawa Steel Div., Young Spring and Wire Corp., Ottawa, Kans., for complete literature.

Sidecrane-Backfiller-Tamper, A Versatile 3-Way Machine

125. A 3-way machine, the Cleveland 80W, that is a backfiller, sidecrane and tamper is described fully in a 12-page Bulletin, No. L-102, available from The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. Design and construction features, photographs of the machine in operation and complete dimensions and specifications are covered. Check the reply card.

Finest Line of Markers for Fine Line Marking

165. Complete information on truck mounted highway markers, self-propelled line markers, all purpose line markers, and hand-propelled line markers is available from the M-B Corporation, New Holstein, Wis. Photographs and specifications of each type of line marker are included. For more, check the handy reply card.

How to Get Better Grader Operation

111. A most interesting and instructive 20-page illustrated action booklet on how to operate a motor grader is now available from Galion Iron Works & Mfg. Co., Galion, Ohio. Designed to help operators get more effective use from the versatile motor grader, this booklet covers the hydraulic system, steering, tips on leaning wheels, proper blade positioning, turning, gear speeds and operating procedures. Colorful, easy-to-read presentation guarantees good readership. Check the reply card for your copy

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Illustrated Specifications on Brush and Limb Disposal

222. A new booklet on the modern approach to the brush problem shows how an Asplundh chipper reduces bulky branches and brush trimmings to chip size for mulch or easy removal. Write Asplundh Chipper Company, 505 York Road, Jenkintown, Pa., or use the handy reply card.

Eaton 2-Speed Axles For Your Trucks

264. Truck axles that provide easy shift, supply positive lubrication and have a self-contained air brake are available from Eaton Mfg. Co. For complete information on these rugged axles check the reply card or write Eaton Mfg. Co., Cleveland, Ohio.

Use The Reply Card

Complete Facts on New Extra Heavy Duty Trucks

272. Bulletins covering conventional and tilt cab trucks and tandem axle models are available from Ford Div. of Ford Motor Co., P. O. Box 658, Dearborn, Mich. Check the reply card.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "EZ-On" traffic sign faces ready for immediate shipments. Reflectorized faces cost about one half as much as new signs and are easily attached to existing traffic signs. Grace Sign & Mfg. Co., St. Louis 18, Mo

Complete Specifications on Aluminum Fencing

327. Chain link fence of Alcoa aluminum for highways, divider strips and rights-of-way have 30 rust-free years without painting. Check the reply card or write Aluminum Company of America, 2147-F Alcoa Bldg., Pittsburgh 19, Pa., for File 14-K that contains complete specifications and technical data.

Precast, Prestressed, Pretensioned Concrete Bridges

349. Colorful bulletin, well illustrated, shows the manufacture of Amdek prestressed bridge members. Check the reply card for this helpful bulletin or write Concrete Products Div., American Marietta Co., 101 East Ontario St., Chicago 11, Ill.

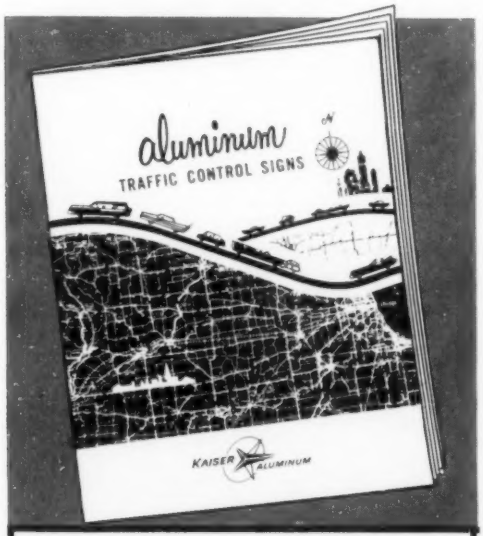
Hand Operated Soil Sampling Kit

366. Bulletin 26-R describes the Acker soil sampling kit that contains 12 different soil sampling tools packed in a handy steel case. Check the reply card or write to Acker Drill Co., Inc., Scranton 2, Pa., for data on tools that are designed to take soil samples from practically any material.

Concrete Cutting Machine

454. A concrete cutter that has a front alignment pointer, hinged blade guard, 18 hp engine, right or left hand operation and control, uniform depth of cut is described in literature from Felker Mfg. Co., Torrance, Calif. Check the reply card.

NO OTHER SIGNS *install so easily . . . last so long . . . require so little upkeep . . . or make such an ideal base for message materials. When you consider their savings . . . compare their light weight, strength and corrosion resistance . . . could you really afford anything else* BUT ALUMINUM?



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Eastern Metals of Elmira, Inc.
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S. G. Adams Co., 920 Olive St.
Parco Supplies, 729 Manchester Ave.

SHREVEPORT, LOUISIANA
Standard Brass & Mfg. Co.
P. O. Box 3626

TACOMA, WASHINGTON
Traffic Control Signs Co.
3011 S. Chandler

WICHITA, KANSAS
Miro-Flex, Inc., 1824 E. Second St.

To order these helpful booklets check the reply card opposite page 34.

Ultra-Clean Sweeping For Streets, Yards and Airports

499. A new approach to extra-clean sweeping is described in a 4-page illustrated Bulletin (No. 85.55) issued by the G. H. Tennant Co., 755 N. Lilac Drive, Minneapolis 22, Minn. Described is a 7'4" path sweeper that eliminates the use of water for dust control. Check the reply card.

Construction Guide For Engineers and Builders

669. A 34-page four sectioned construction guide containing full-page structural drawings that provide basic information on types, grades and applications of fir plywood for engineers and builders has been released by Douglas Fir Plywood Association, Tacoma 2, Wash. Check the reply card for data on floor construction, single and double wall construction and roof construction.

What You Should Know About a Motor Grader

673. Photographs, sketches and other instruction illustrations aid readers to visualize details of the Allis-Chalmers Model Forty-Five motor grader mechanical features and components. The catalog also tells about attachments and accessories. Write Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, Wisc.

Aluminum for Complete Line of Signs and Sign Blanks

675. Valuable information on aluminum's advantages, features and economies, plus details on application of all sign message materials are covered in the aluminum sign bulletin from Kaiser Aluminum & Chemical Sales, Inc., Dept. MU-936, 919 N. Michigan Ave., Chicago 11, Ill. Check the reply card today.

Literature on Reflective Glass Beads

690. Glass beads for traffic signs and street name signs are described in literature available from Flex-O-Lite Mfg. Corp., 8305 Flex-O-Lite Drive, P. O. Box 3066 (Affton Br.), St. Louis 23, Mo. Beads can be used on white and yellow signs. Check the reply card

Power Shovel, Crane and Backhoe All in One Unit

441. A completely hydraulic backhoe, shovel loader and crane all in one unit is described in literature available from the Badger Division of Warner & Swasey Co., Winona, Minn. Also information on front-end loaders, truck and trailer mounted hydraulic backhoes and various attachments that are useful for contractors, municipal and county engineers and state highway engineers. Check the reply card.

Catalog on All Phases of Brush Disposal

771. This informative 2-color catalog gives complete detailed information on Fitchburg Chippers, and includes drawings, specifications, diagrams and charts. Check the reply card or write Fitchburg Engineering Corp., Fitchburg, Mass., today.

REFUSE COLLECTION AND DISPOSAL

New Roto-Pac Features Speed Refuse Collection

50. Features of the Roto-Pac refuse collection unit, which include automatic continuous loading and packing, with increased power to provide for larger loads in the same size body, are described in bulletins issued by City Tank Corp., 53-09 97th Pl., Corona, L. I. Check the reply card now to learn how your collection problems can be eased.

Methods and Benefits of Sanitary Landfill

409. Information on Sanitary landfill methods, organization and necessary equipment with which to carry out the job is available from the Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis. Check the reply card today.

Developments in Refuse Collection

119. The "Dempster-Dumpmaster" system for refuse collection combines the advantages of detachable containers for bulk collection, convenient front-end loading and compaction in a sealed body. Be sure to investigate the application of this system to your collection needs. Complete data offered by Dempster Bros., Knoxville 7, Tenn. Check the reply card today.

How to Construct A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 15, Wis. Get your copy by checking the reply card: you'll find this booklet both interesting and valuable.

Sanitary Landfill—Answer To a Community Problem

348. This package of materials is designed to help interested communities and group plan and operate a sanitary landfill program. Different methods of refuse cover are discussed, as well as what type of collecting, compacting and excavating equipment is best for each type of landfill. Check the reply card or write to Caterpillar Tractor Co., Dept. NS, Advertising Div., Peoria, Ill., today.

BUSINESS ADMINISTRATION

System For Duplicating and Filing Engineering Drawings

754. The Recordak system for comprehensive filing of engineering drawings is described in literature available from Recordak Corp., 415 Madison Ave., New York 17, N.Y. Drawings are first microfilmed and then they are added to an aperture card for indexing.

FILTER SAND AND GRAVEL

Produced from an inland pit hence free from river contamination and foreign matter.

Shipment in bulk or bagged.

Many of the larger filter plants throughout the United States are equipped with our products.

PROMPT SHIPMENT

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Muscatine, Iowa
P.O. Box 307 Amherst 3-2711

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SHAWNEE.
"88" BACKHOE and SPECIAL Heavy Duty LOADER

Economy Priced!

Today's fastest backhoe. Digs 12' deep, dumps at 9'9", swings 188°. This hard-working tool reduces costs, requires minimum maintenance — it is versatile and moves easily from location to location. Built by the pioneer of the hydraulic backhoe.

Send for specifications and prices.

Loader Attachments:
Various sizes Utility and Material Buckets, Snow Bucket, Angle Dozer Blade, Bulldozer Blade, Crane Hook, Fork Lift, Manure Fork and Street Broom.

Serving in many industries all over the world.
SHAWNEE MANUFACTURING CO., INC.
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To order these helpful booklets check the reply card opposite page 34.

STREET LIGHTING AND TRAFFIC CONTROL

Safety and Efficiency With 3-Way Traffic Control

63. El-Tec radio interconnection enables cities to have complete traffic control in traffic programming, control originating with emergency vehicles and Civil Defense evacuation control. Check the reply card or write Electronic Protection Inc., 2085 North Hawthorne Ave., Melrose Park, Ill., for complete literature.

Engineering Data on Aluminum Lighting Standards

256. Latest designs and applications of all-aluminum, seamless, tapered lighting standards, and elliptical lighting brackets plus detail drawings and mechanical specifications are provided in a comprehensive 16-page bulletin issued by Pfaff & Kendall, 84 Foundry St., Newark, N. J.

RECREATION

How to Equip Your Parks and Playgrounds

414. A handsome 60-page illustrated catalog showing a full line of extra heavy duty playground, park picnic and dressing room equipment, plus many related items, is now available from American Playground Device Co., Anderson, Ind. Complete specifications, construction features, prices and details of labor and materials needed for installation are included. Check the reply card.

SNOW AND ICE CONTROL

Get Full Data On Aggregate Spreaders

34. Accurate control for spreading asphalt, crushed rock, chips, sand or ice control materials is featured by all models of Highway Equipment Co. materials spreaders. Data on towed, truck mounted and tailgate types available by checking the reply card. Highway Equipment Co., 630 D. Ave., Cedar Rapids, Iowa.

Uniform Salt Spreading Saves Material

42. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on their spreader and table of material application rates. Use reply card or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Bare Pavement Maintenance With Sterling Rock Salt

84. Handbook is designed for road maintenance men who are responsible for safe winter pavements; and is a safe-roads fact book about a modern snow and ice removal program. Check the reply card or write International Salt Co., Inc., Scranton, Pa.

How to Make Icy Surfaces Safe

455. A bulletin on how calcium chloride works in ice control and directions for its use has been made available by Wyandotte Chemicals Corp., Michigan Alkali Division, Wyandotte, Michigan. Other uses of calcium chloride are fully outlined.

Full Line of Weapons for Snow and Ice Battles

268. Whether your snow problems are heavy or light, you'll find equipment for virtually all your needs among the plows and spreaders offered by Good Roads Machinery Corp., Minerva, Ohio. The "Champion Line" of Vee plows and one way and reversible plows with safety blade trip will handle snow removal; for chlorides and abrasives spreading there are five "Jet Line" spreader models and the 4-U towed spreader.

Reversible and Roll-Over Type Snow Plows for any Depth of Snow

389. Village, city, county, state and airport officials send for the latest information on Frink's two catalogues on reversible trip-blade and roll-over snow plows. Complete assembly details, specifications and operation are completely outlined. Write to Frink Sno-Plows, Inc., Clayton, New York.

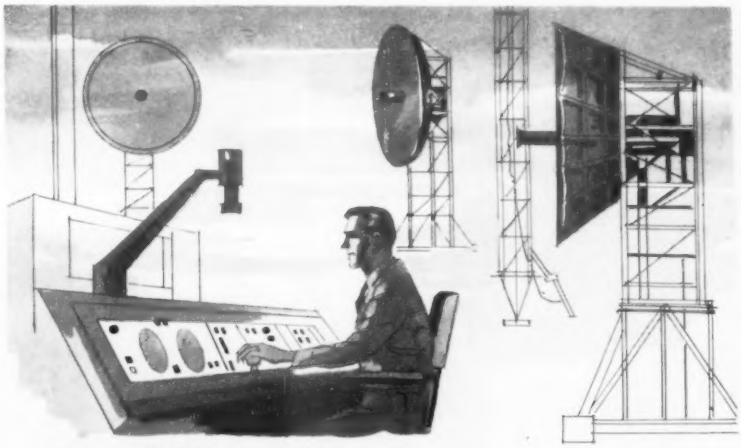
Ice Control Without Corrosion Dangers

439. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa.

For Prompt Service Use The Reply Card

Rock Salt For Ice and Snow Removal

534. Application rates and procedures of using Morton rock salt for ice and snow control are covered in catalog from Morton Salt Co., 110 No. Wacker Drive, Chicago 6, Ill. Check the reply card for Catalog F-35.



Significance of the DEW LINE

In these days of war and rumors of war, America has just completed one of the greatest construction jobs in history—the 3,000-mile Distant Early Warning Line in the Arctic—called the "DEW" line. It is said to rank with the building of the Pyramids, the Great Wall of China, the Panama Canal, and the Burma Road. Its function is to give early notice to U. S. Military Defense Forces of the approach of enemy aircraft.

There is no way to know, of course, just what might become the U. S. target of enemy planes or intercontinental missiles. But let your imagination picture the result if an enemy could destroy a number of our water works distribution systems. In a short time, the Nation would be paralyzed.

The possibility emphasizes how much the American economy, yea our very civilization, depends upon our modern systems of water distribution. Your water system is buried underground—but don't forget it is there, nor how vital it is to your daily existence.

This Series is an attempt to put into words some appreciation of the water works men of the United States.

M&H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA
SUBSIDIARY OF WALWORTH

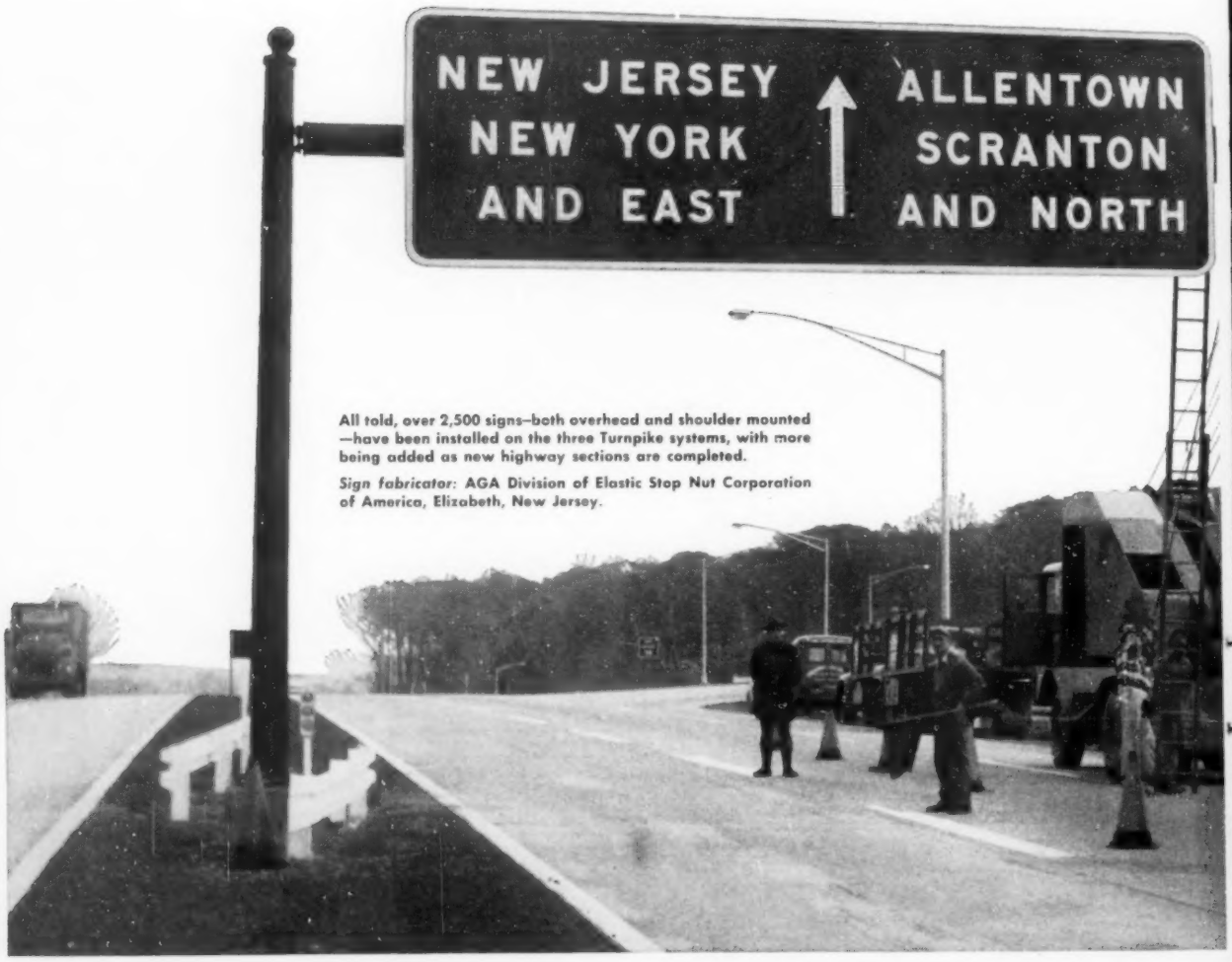
New Jersey Turnpike
New York State Thruway
Pennsylvania Turnpike

Overlaid plywood on the new

KING SIZE OVERLAID PLYWOOD SIGNS take the guesswork out of motoring along the new controlled access highways that speed traffic to and from the busy Eastern metropolitan areas.

Strategically located and reflectorized for nighttime legibility, these bright, easy-to-read signs make the New York Thruway and Pennsylvania and New Jersey Turnpikes a prime example of efficient highway signing. And because they cost less than signs of other materials—both initially and in long-term maintenance—overlaid plywood helps do this better signing job for less money.

Signs of overlaid plywood stand up better under severe weathering, deliberate or accidental abuse. Plywood's strength and stiffness simplifies framing. Standard panels can be easily cut or combined to make signs of any size or design. The durable plastic-like overlay prevents checking, provides an ideal base for paint or reflectorizing.



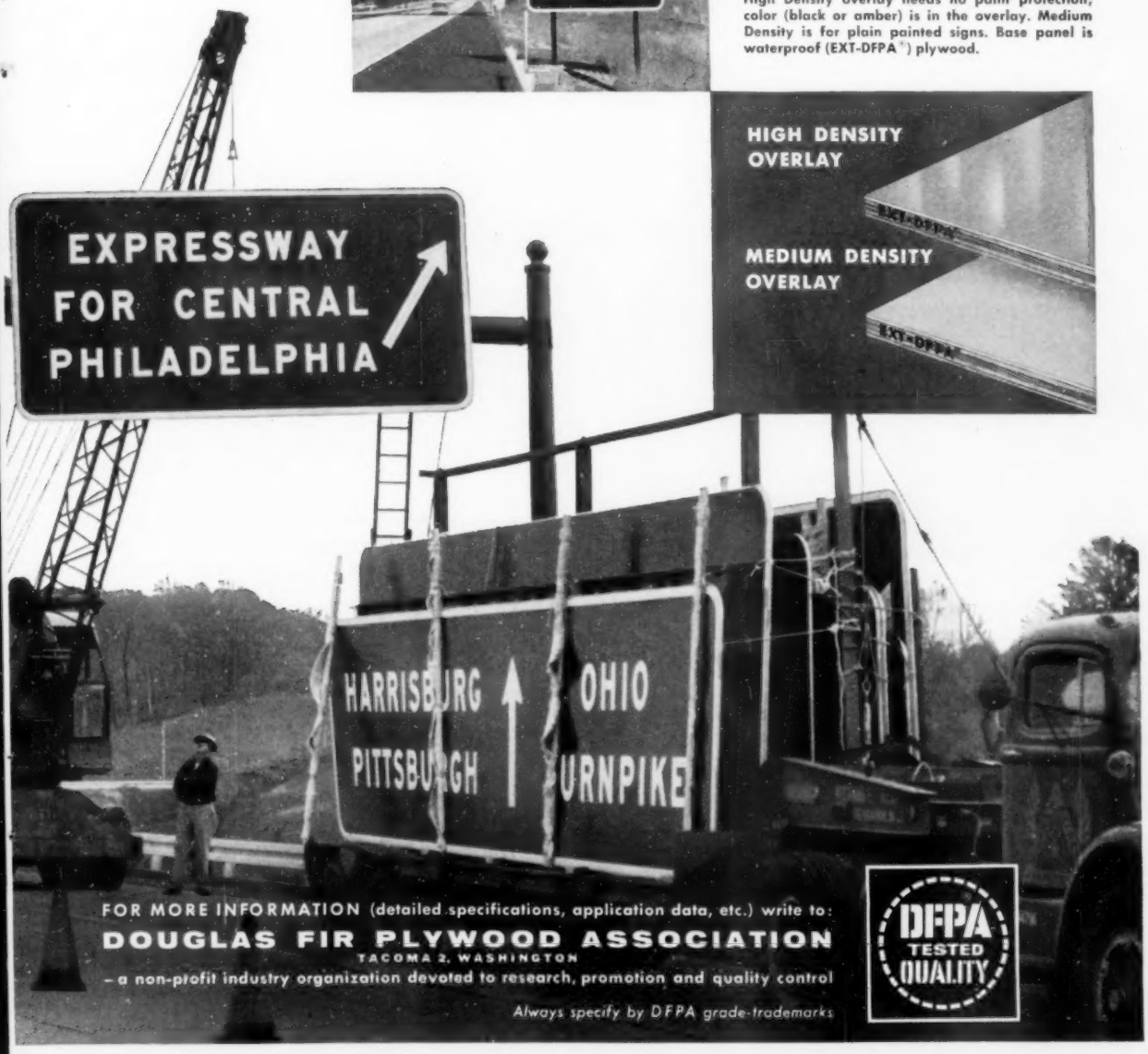
All told, over 2,500 signs—both overhead and shoulder mounted—have been installed on the three Turnpike systems, with more being added as new highway sections are completed.

Sign fabricator: AGA Division of Elastic Stop Nut Corporation of America, Elizabeth, New Jersey.

helps cut signing costs eastern turnpike systems

Overlaid plywood sign panels are stronger, more durable than metal. On shoulder mounted signs, fir plywood's greater stiffness means backing or supporting framework can be eliminated.

Durable overlay eliminates checking, grain raise. High Density overlay needs no paint protection; color (black or amber) is in the overlay. Medium Density is for plain painted signs. Base panel is waterproof (EXT-DFPA) plywood.



FOR MORE INFORMATION (detailed specifications, application data, etc.) write to:

DOUGLAS FIR PLYWOOD ASSOCIATION

TACOMA 2, WASHINGTON

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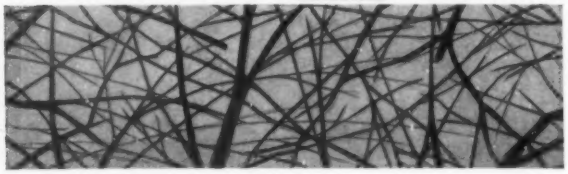
You can chip more brush



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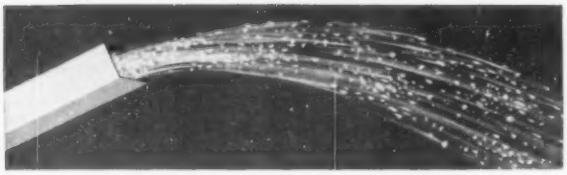


at less cost

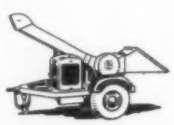
with an ASPLUNDH CHIPPER

than with any other machine on the market today!

Asplundh Chippers can cut your hauling cost 75%, completely eliminate brush burning, and provide a useful, valuable by-product.

So ravenous is its appetite, so powerful its motor, and so fast its chipping action, it is equalled by no other. Yet it is so simple in design that maintenance is reduced to an absolute minimum.

Write *today* for full details. Better—ask for a prompt demonstration, without the slightest obligation.



ASPLUNDH CHIPPER COMPANY
505 York Road, Jenkintown, Pa.

By Actual Test the Fastest Chipper Made

COMMENTARY on WATER and SEWAGE TREATMENT

Whither Package Plants?

R. S. RANKIN

Consultant, Water and Sewage Treatment

RECENT ADDITIONS to the sewage treatment equipment field include several package units which are truly packages in the commercial sense. They are fabricated at the factory, shipped assembled, placed on a foundation and ready to turn out an effluent as soon as connections are made. Where does this development lead to; where does the consulting engineer fit in; what do the regulatory agencies think of them; are they reliable and here to stay? These and other questions confront the potential user as well as the practicing sanitary engineer and the equipment company.

Package plants, so called, are not new, dating back several decades to factory made septic tanks and more recently to the mid '30s when combinations of units of specific dimensions and capacities were offered by equipment companies. These were obviously efforts at equipment standardization as well as aids to the designing engineer. Equipment for sewage treatment is largely tailor made and the more it can be standardized the more reasonable the price. This type of packaging of equipment is still very much in use but it differs materially from the complete factory assembled unit. However, many of these remarks do apply to this older type of package.

Up to 15,000 GPD

Package plants of the factory assembled type now being offered are designed to provide complete biologic treatment to flows up to 15,000 gal. per day per unit. Although multiple units can be used, the attractiveness from the standpoint of first cost and operation requirements would seem to diminish. The size and hence capacity of these plants is limited by transportation facilities from factory to plant site. This limitation could be overcome by disassembling the shipment but this would defeat the purpose.

Since these units are already designed and constructed with specific capacities or ratings by the equipment company, a consulting engineer called in on a proposed installation has little to do except pass judgment on the merits of the unit and its application to the job. However, it is a question whether many established engineering firms are interested in this type of consulting work or can afford the time or expense to take on such small jobs except as a favor. In any case responsibility for the design and successful operation falls squarely on the equipment manufacturer. The principle of the package unit is not unlike the homeowner who buys a prefabricated house or only a set of plans and deals

WILL YOUR NEXT TANK OR RESERVOIR GIVE YOUR COMMUNITY THESE PROTECTIVE ASSURANCES?

. . . It will, if it is CB&I -BUILT. . . of WELDED STEEL CONSTRUCTION

It's easy to take steel for granted. Evidence of its workability and durability can be seen anywhere, anytime, any place. But its *particular* dependability as a material of construction for water storage structures reaches beyond the commonplace.

Here is why *CB&I* uses steel; why most *consulting engineers* specify steel; and why more water for municipalities is *stored* in steel than in any other material of construction:

CB&I STEEL TANKS are built to AWWA Specifications—To a factor of safety established by the collective experience of the best engineering knowledge available on the subject of water storage.

CB&I STEEL TANKS ARE "Tight"—A fact that is accepted without question even *before* the structure is fabricated and erected.

CB&I STEEL TANKS are flexible—to provide only specified *known* amounts of differential settlement, which do not affect the utility or safety of the structure.

CB&I STEEL TANKS are stable structures. There is no loss in effective strength of material with the passage of time.

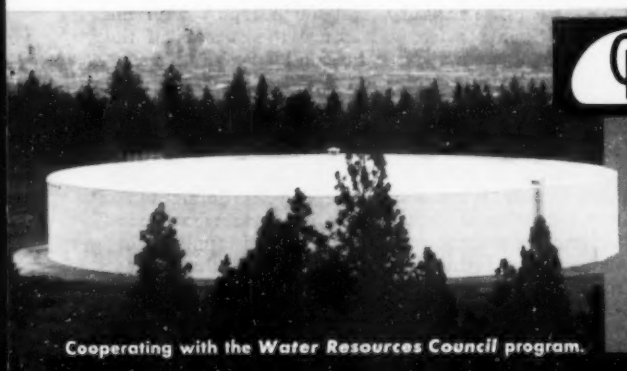
CB&I-BUILT STEEL TANKS are the *responsibility* of CB&I through all phases of design, fabrication and erection. Almost 70 years of engineered *craftsmanship in steel* back every structure. This is your assurance of predictable maintenance costs and long service life.

Be *glad* you can take steel for granted. When your community next considers water storage, remember, *only* steel can *assure* you long term, low maintenance storage—because it is backed by the accurate control and protective assurances established by the American Water Works Association.

Write your nearest CB&I office for further details. Ask for the new bulletin: *Next Door Neighbor to Millions.*

Above: 10,000,000-gallon Horton Cone-roof reservoir meets increased water demands at Oakland County, Michigan.

Below: 10,000,000-gal. Horton® reservoir helps to supply increased water needs at Spokane, Washington. Structure is 240-ft. in diameter.



Cooperating with the *Water Resources Council* program.

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GREENVILLE, PA. and at NEW CASTLE, DELAWARE.
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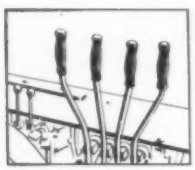
Hopto®

. . . outperforms any ⅜ yard machine!

Hopto's 200° uninterrupted swing, fast cycling time, 19′ ground reach and 13′ 6″ digging depth offer outstanding work capacity at modest equipment investment.

The heavy-duty *72 gpm* hydraulic system has power to spare for toughest digging. Hopto's 180° wrist-action of the backhoe makes handling of rock, broken concrete or blacktop, and frozen soil easy and profitable . . . permits square cornered digging for forms, footings and foundations.

Hopto takes your toughest jobs in stride . . . cuts working time—increases profits.

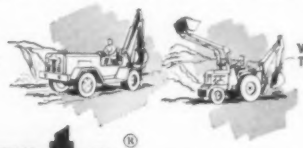


UNINTERRUPTED 200° SWING!
SAFE, SURE, CUSHIONED CONTROL

Easy to use hydraulic controls are quickly mastered. Hand levers and foot pedals enable operators to combine movements for faster cycling . . . Operation is fatigue-free, *SAFE!*

Choice of models to fit your requirements

SELF-PROPELLED WHEEL OR TRACK



WHEEL OR TRACK TRACTOR MOUNTED

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Please send me all the facts on Hopto's exclusive advantages.

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directly with a contractor, consulting with an architect briefly if at all.

The purchaser of such a package plant needs and is entitled to safeguards considerably beyond that of the individual homeowner. He must have assurance that the unit is applicable to the task; that it will yield an effluent acceptable to authority; that operation is not too burdensome or beyond his technical skill; and finally that given competent maintenance it will have a reasonable life. Even if a consultant is called in, the client must rely entirely on the integrity and experience of the equipment manufacturer for this assurance.

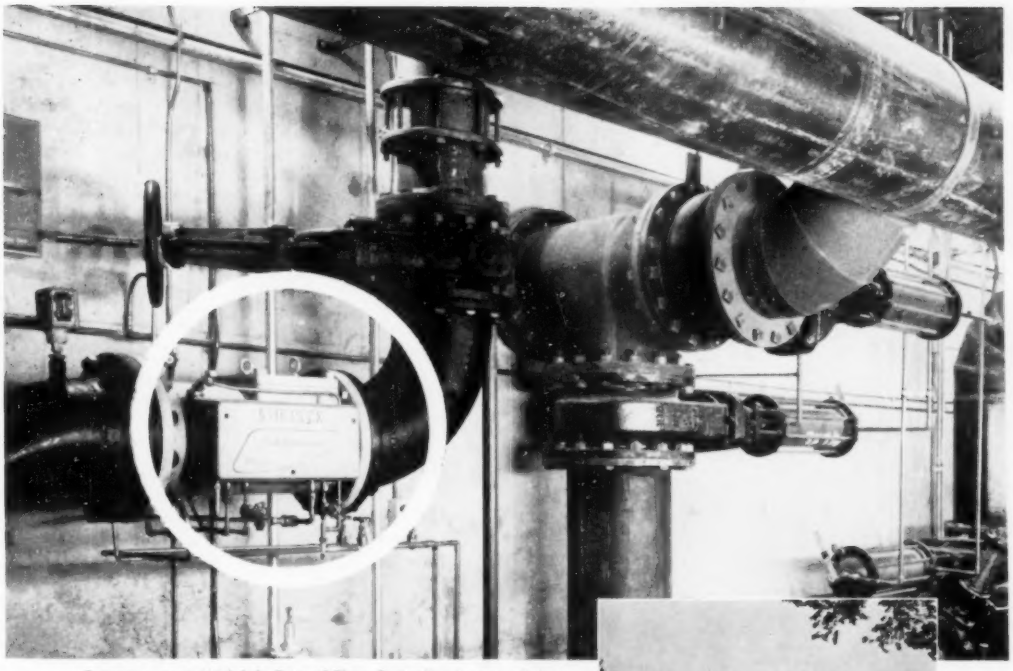
Treatment plants, even of the package type, must meet requirements of regulatory agencies. They must produce effluents acceptable to these agencies which in the majority of instances now call for secondary or complete treatment. Thus any prospective purchaser of a package unit must become familiar with requirements for his specific conditions and find out what will fulfill them. Also regulatory agencies require approval of plans by a registered professional engineer. Therefore, for his own protection, the purchaser should engage a consultant who should be a specialist in this field, unless someone on his own staff qualifies by virtue of knowledge and registration.

Satisfying the regulatory agency that the package plant will do the required job is most important and, regardless of who handles the engineering aspects, it will probably devolve upon the equipment company representative to convince the authority. For this reason designs should be carefully made and have ample capacities to cope with the uncertainties which are certain to arise in such applications. They should be based on proven processes and arranged for operation by unfamiliar hands. Performance claims should not exceed those obtained by similar processes in large scale installations. Most equipment companies employ experienced sanitary engineers competent to design a package plant to fulfill these requirements and to perform as required.

Marketing vs Operation

Marketing a package plant is one thing and operating it is another and this is where an obligation also rests on the equipment company, more so than in large plants. Usually, the package plant will be operated by someone unfamiliar with the principles of sewage treatment whose only continuing source of information is the representative of the equipment company. To meet this situation the company should obligate itself to assign a man not only to start the plant but to "look in" every so often to make sure that operation is satisfactory. In fact, the purchaser of every package plant should insist that the price includes the services of a competent engineer to start up the plant and to inspect it once a month, for a year if necessary, and file a report with the owner. Such service will assure the success of the package plant and earn the confidence of the sanitary engineering profession.

Many may question the need for package plants. Obviously there is no substitute for disposal into a sewerage system but recent literature abounds in discussions of suitable treatment facilities for those establishments inaccessible to sewers. Septic tanks and tile fields are appropriate for certain conditions but more stringent restrictions are continually being imposed by authorities with the result that except for the individual home installation properly isolated,



Compact, neat Modulair Rate-of-Flow Controller is one of three 10-inch units at this modern plant in Fairmont, Minnesota. *Pictures courtesy of the Fairmont Water Commission.*

Modulair Flow Controller installs as easily as a piece of pipe

So simple is this new pneumatic rate-of-flow controller you can install it in about the time it takes to plumb a piece of pipe.

The differential producer and the modulator are housed in a single casting. The actuator is entirely enclosed in a case which mounts directly on this pipe section.

There's no complicated piping or drain system to install. The Modulair comes direct from the factory as a completed unit.

Low first cost. This simplicity of design makes an *installed* Modulair about the lowest cost flow controller around.

Low maintenance too. There are no moving parts in the line other than the modulator and nothing to wear out but the actuator. No stuffing boxes. Maintenance is practically nil.

How Modulair works. Under flow conditions, the venturi section sets up a differential pressure which causes the diaphragm to position a counterweighted beam. The beam controls a variable pneumatic output pressure against a rubber modulator beyond the piezometer ring of the venturi . . . assures positive control of the flow rate.

Send for bulletin. The whole Modulair story is told concisely in Bulletin 951. Write for a copy.

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VALVE AND METER COMPANY
a subsidiary of PFAUDLER PERMUTIT INC.
LANCASTER, PENNSYLVANIA

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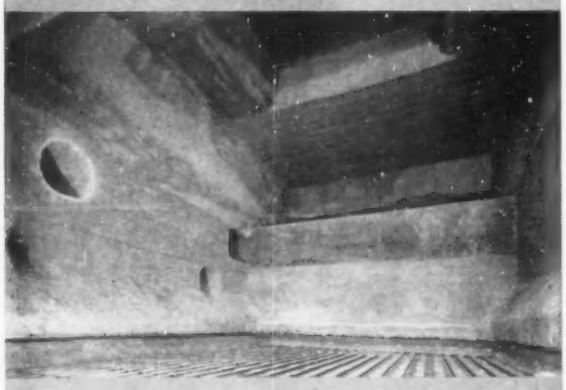
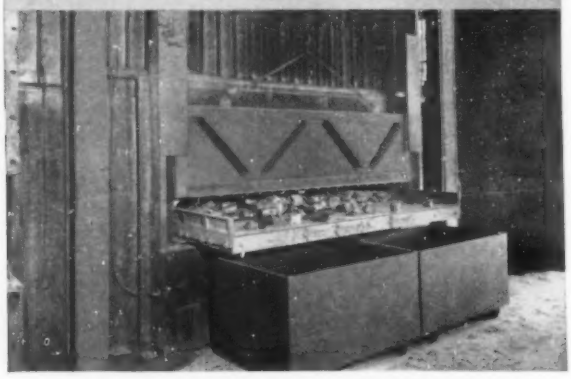


WITH THE
COMBUSTIKATOR STOKER



COSTS LESS TO BUILD,
OPERATE, MAINTAIN

You can cut the size of your incinerator building by a full story . . . and save accordingly . . . when you specify a Plibrico Incinerator equipped with the effective new Combustikator stoker. Tried and proven at Skokie, Ill., this stoker provides automatic ash discharge, eliminating the need for costly, space-consuming ashpits . . . hence the full story saved. Additional savings can be realized on the cost of the incinerator itself, the amount varying with the type of ash handling system you prefer.

Operational savings can be affected through reduced manpower, for in addition to automatic ash discharge, the Combustikator has a stoker surface that's self-cleaning.

From the maintenance standpoint, the anchored monolithic lining of a Plibrico Incinerator is more durable than ordinary fire brick construction. It's the joints that cause trouble and needless expense, and a Plibrico lining doesn't have those countless joints.

Plibrico designs incinerators for municipalities of all sizes. Discuss your needs with us or with your local Plibrico distributor. Find out more about the advantages above, and many others as well. To effect the greatest savings, do it before you finalize your plans.

Plibrico INCINERATORS

1800 KINGSBURY STREET • CHICAGO 14, ILLINOIS

septic tanks are more and more in disfavor. The package plant fills a gap between the individual septic tank and the installation large enough to justify treatment in separate elements of standard size. Its mechanized features are in keeping with the times and its general appearance provides the owner with visible evidence of his expenditures which buried septic tanks do not. Also, it is far more interesting to push buttons and watch what happens than to bury a tank and wonder.

No mention of performance or description of specific types are included, nor are cost figures. At present one company offers a unit which includes two stages of high rate filters, primary and secondary sedimentation, and sludge digestion in one container. Others are offering those of the activated sludge type which include 24-hour aeration and final sedimentation with no separate digestion. Aeration is by compressed air or by mechanical means. These examples have been approved for numerous installations. Cost of these units should compare with other comparable treatment facilities although compactness might justify something in addition.

The package plant will be judged by its performance. To earn a position of confidence and general acceptance it must live up to the manufacturer's claims and preferably do a little bit better. If it does it is here to stay and it will find hundreds of applications.

• • •

Water Use Reaches Record

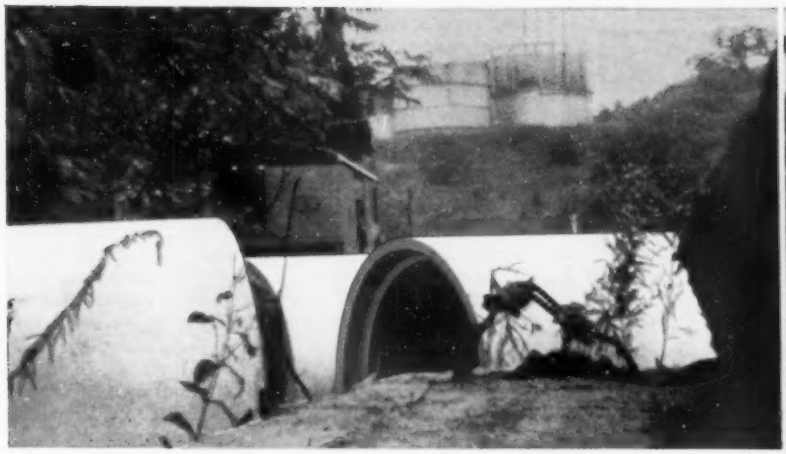
Water consumption in the area served by the Phoenix, Ariz., water system reached a record high in 1957-58. Total water consumed was 19,905 million gallons in 1957-58 as compared to 16,774 million gallons in the 1956-57 fiscal year. This increase reflects the tremendous expansion in the water service area when 5 private water companies serving 35,531 customers were purchased in December, 1957, by the City as part of the $35 million water bond expansion program. The number of customers now being served is 100,776 as compared to 62,142 last year. The maximum water consumption during a single 24-hour period during 1957-58 was 134.6 million gallons.

Portable Dump System Lowers Cost of Highway Roadside Cleanup

The belt system to speed highway travel in and around the suburbs approaching Kansas City, while helping to solve the problems of traffic congestion, created a problem of highway litter control. Trash including tin cans, bottles, tires, wire, lumber and drums caused damage to cutters, mowers and other highway equipment. The unsightliness and offensive odors brought complaints from residents near the areas. In one three-mile stretch of Blue River Road, the sum of $30,029 was estimated as needed to remove 5,000 truck-loads of trash and replace damaged surfacing.

The clean-up method employed was to use all available county dump trucks and crews and to enlist labor from the county prison. It cost the county $14,410 to police the highways in one intensive drive. Although this helped to relieve the clutter of debris temporarily, it did not provide a means to prevent the situation from developing again.

The system of materials handling manufactured by The Ingersoll Kalamazoo Division, Borg-Warner



PITTSBURGH Project

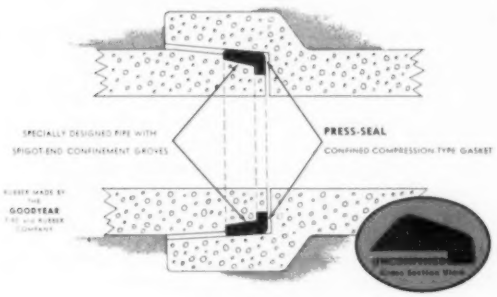
Selects PRESS-SEAL Rubber Gaskets

CONSULTING ENGINEERS: Consoer, Townsend and Associates, Chicago, Ill.

RESIDENT ENGINEER: Anthony L. Vallillo, Pleasant Hills, Pa.

CONTRACTORS: Intercounty Construction Corporation, Hyattsville, Md. Nicassio Construction Company, Verona, Pa.

Reinforced concrete pipe designed to use Press-Seal Rubber Gaskets furnished by American Marietta Co.



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- **Speeds Installation**
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More and more engineers throughout the United States and Canada are specifying Press Seal Gaskets.

The lowest cost material item in any Pipe-line Project is a PRESS-SEAL Gasket

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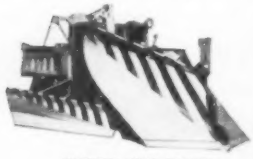
Specialists Since 1921 in

SNOW PLOW KNOW-HOW

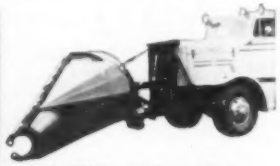
Since the first steel plow (a Frink) hit the highway 36 years ago, every major advance in snow plow design and performance has been a product of Frink "know-how." Today there are four basic types of Frink Sno-Plows, each with models to fit trucks from 1½ to 12 tons, and most are interchangeable on the same attachment.

Whatever your area's snow removal problem, Frink makes THE plow best equipped to do the job faster, safer and at lower operational cost for plow **and truck.**

Learn all the facts and reasons why so many cities, towns, counties and states specify Frink Sno-Plows. See your distributor or write to Frink for descriptive folders about these plows.



V-TYPE SNO-PLOW
—rugged powerhouse for high-speed, heavy-duty highway work; leveling wings optional.



ROLL-OVER with Taper Blade
—for airports, expressways; rotates left or right in seconds; ends "dead-heading."

ONE-WAY with Trip Blade
—for high-speed throwing and spreading, but windrows neatly at city speed.

REVERSIBLE Trip Blade
—all-purpose; plows left, right, bulldozes ahead; power reverse lever in cab.

For Snow Plow Know-How It Pays to Think of FRINK SNO-PLOWS

Clayton, 1000 Islands, N. Y.
Frink Sno-Plows of Canada, Ltd., Toronto, Ontario

Corp., was put on a trial basis. It consisted of spotting several metal 20 and 25-cu. yd. containers along the highways to serve as portable dumps. As the containers were filled, they were picked up by a truck equipped with a special hoist, brought to the disposal area, dumped and returned to the original location.

In the first month, 930 yards of trash were deposited in the containers, removed and placed at the dump. In the second month, over 1,200 yards of trash were handled in this manner; and for the third month, 1,580 yards of trash were handled. Jackson County purchased two specially equipped trucks and several containers as reports indicated increased satisfaction with the system. Expenditures for clean-up were greatly reduced by the portable dump system.

As reported by Everett Miller, Supt. of Maintenance, Jackson County Highway Dept., the road once closed to traffic because of litter accumulation, is now the scenic highway for which it was intended. Damage to highway equipment has been avoided. Home owners have been able to find a suitable place for depositing the accumulated wastes and are saved long trips to the county dump.

Sand and Gravel Handling Equipment for Filter Rehabilitation

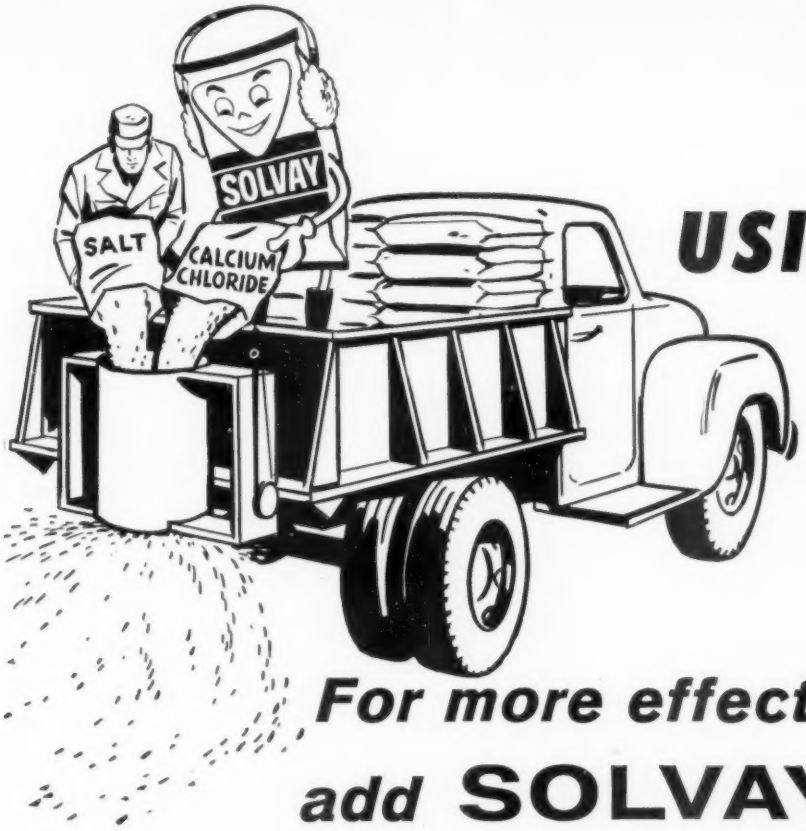
At intervals for the past two years, work has been under way in Chicago on the sand and gravel handling equipment at the Water Filtration Plant. During construction of the plant, much of which was done during and following World War II, the difficulty in obtaining priorities on materials not immediately needed in the operation of the plant caused postponement of the installation of much of the facilities for handling sand and gravel. At that time, several designs were considered and abandoned as being too expensive. The plan had to be studied more fully and some of the equipment had to be tried before including it in the plant design.

The present design provides for handling the sand and gravel to and from the filter units by hydraulic means. To unload a filter, the sand is first pumped to sand bins for storage. Then the mixed material, including some sand and some fine gravel, is pumped onto a vibrating screen to separate the sand from the gravel. This screening is done in the wet, which is unusual for vibrating screens in filtration plant work.

The gravel, up to ¾-inch size, is to be removed by hydraulic means. Up to the end of 1957, movement of material larger than the ¼ to ⅛-inch size has not been tried. Using a new pump, it is planned to remove all gravel except the two layers of the large size material; that is, the ¾ to 1½-in., and the 1½ to 4-in. sizes. It is believed the large sizes of gravel can be handled in the bed without removal, in case it is necessary completely to rebuild the bed. A second vibrating screen will be used for sieving the gravel mixture to various sizes.

County Has 564 Road Bridges

There are 27 major bridges in Allegheny County, Pa., which span the Allegheny, Monongahela, Youghigeny, and Ohio Rivers; 29 multiple span bridges; 241 single span bridges; and 267 minor bridges and culverts over railroads, highways, gulleys and minor streams. The county has 499 miles of paved roads and 16 miles of earth roads.



USING SALT FOR ICE?

For more effective results add SOLVAY CALCIUM CHLORIDE

The use of calcium chloride-salt mixtures for ice control have these advantages over straight salt . . .

1. Effective at all temperatures and humidities. The calcium chloride speeds melting even at temperatures and low humidities where salt is ineffective . . . provides the moisture salt needs to act.

2. Quicker acting. Calcium chloride liberates heat as it melts ice, which helps salt work faster.

3. Store better in bulk—when storage area is covered.

4. More economical to use. When you combine salt *and* SOLVAY Calcium Chloride, applications can be lighter and less frequent. This reduces chemical consumption and reduces cost.

Abrasives treated with SOLVAY Calcium Chloride instantly skidproof icy surfaces—hold fast in wind and traffic at all temperatures. Won't freeze in piles—spread easily.

Small quantities of straight SOLVAY Calcium Chloride rapidly melt and loosen thin films of sleet or glare ice. Leave no white residue on pavements, cars.

Write for booklets for further information.

SOLVAY PROCESS DIVISION
ALLIED CHEMICAL CORPORATION
61 Broadway, New York 6, N. Y.

Please send—at no cost—these booklets:
"3-Way Highway Ice Control with SOLVAY Calcium Chloride" . . . "How to use Chemical Mixtures in Winter Maintenance."

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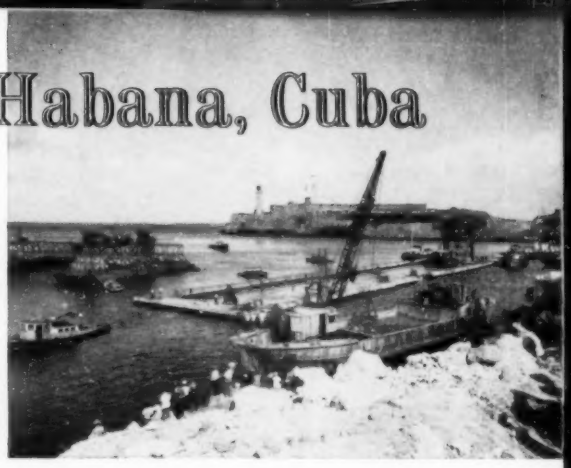
Tunel de la Habana, Habana, Cuba

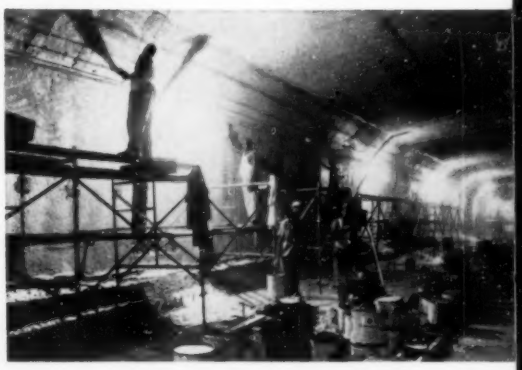
Remarkable engineering accomplishment, protected from water with the **Thoro System Products**



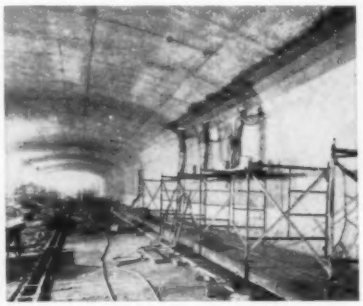
Four-lane, underwater tunnel, connecting Malecon Drive, City of Havana, Cuba with Guanabacoa near the famous Morro Castle, opening the sparsely-populated peninsula to residence and commercial activity.

Mammoth precast concrete sections are floated to location by attached pontoons, lowered 24 meters under water and connected to previously-sunken sections. ***Note the famous Morro Castle. Top, center background.***

Design, engineering and construction by Societe des Grand Travaux de Marseilles, Paris, France, 733 Meters Long, 23 Meters Wide, 7 Meters High, cost $28,500,000.00. Waterproofed inside and outside with THORO System products, THOROSEAL, WATERPLUG and THORITE.



From Havana side, tunnel entrance grades down to harbor pool level.



Thoro System Products applied, completes the job!

Preparing interior surface for WATERPLUG and one brush and one trowel coat of THOROSEAL. All walls, floors and ceilings are sealed with THOROSEAL.

Two double-lane tunnel sections take shape; forms will be filled with poststressed concrete.

THOROSEAL is being applied to all interior surfaces. Over 800 drums of WATERPLUG have already been used, where water was entering and where sections were joined together. All honeycomb and construction faults were sealed with THORITE Patching Mortar, before lowered to position in the bay.

Precast sections of tunnel, honeycomb patched with THORITE Patching Mortar and entire surface protected with THOROSEAL.

Thousands of drums of THOROSEAL, WATERPLUG and THORITE Patching Mortar are being used on this vast project.

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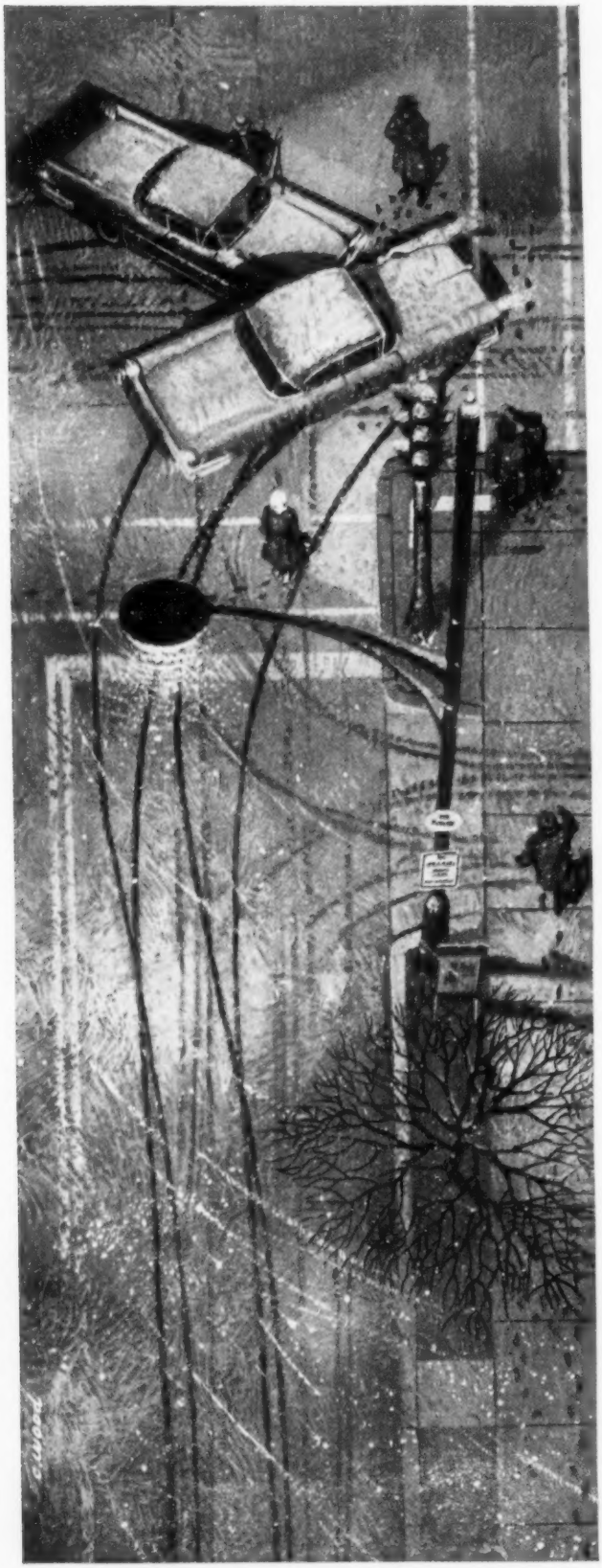
Standard Dry Wall Products, Inc.

NEW EAGLE, PA. CENTERVILLE, IND.



Stop accidents like this! Use straight Morton Rock Salt

Morton Rock Salt works three ways to help prevent winter accidents

1. Morton Rock Salt gives abrasive traction against skidding even before the salt begins to melt the ice.
2. Rock Salt crystals are larger than other commonly used ice melting chemicals and penetrate ice deeper with a corkscrew action, not just melt surface ice.
3. Rock Salt's better penetration reaches the pavement fast and quickly melts the bond between the ice and the street surface.

Morton Rock Salt is safe and economical

Straight Morton Rock Salt is non-toxic. It does not damage animals' paws, rubber, fabrics, leather, asphalt, brick or properly seasoned concrete. It won't clog sewers or leave a rutted, dirty pavement as will sand or cinders. What's more, Rock Salt melts more ice **at lower cost** at any temperature above 8°F. than any other commonly used ice melting chemical.

Send for more information today!

☐ *Please send me your free book on ice and snow removal.*

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INDUSTRIAL DIVISION

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WATER METERS

Properly Designed — Finely Balanced
To Provide Highest Revenue
Year In and Year Out

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(Est. 1859)
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Plant is located on Ponce de Leon Boulevard, main street of Coral Gables, Florida. Walls are decorated with historic scenes done by famous artist John St. John.

In Coral Gables, Florida . . . . .

modern concrete made this sewage treatment plant a good neighbor

A handsome addition to the city, this plant will cause no loss in property values.

More and more communities like Coral Gables, Florida, are handling the construction of sewage disposal plants the modern way: by building a well-designed, odor-free treatment plant of modern concrete that can be a credit to the community wherever it's located.

Concrete used this way can be beautiful as well as practical. In Coral Gables, the sewage treatment plant is almost a civic show place.

Construction costs with concrete are moderate—and upkeep expense is always low. This is one material that can't rust, rot or burn. It lasts a lifetime. When America builds for beauty . . . it builds with modern concrete.

Write for free literature. Distributed only in the U.S. and Canada.

Engineers, Coral Gables project: Smith and Gillespie, Jacksonville, Florida. Contractor: Markowitz Co., Coral Gables, Florida.

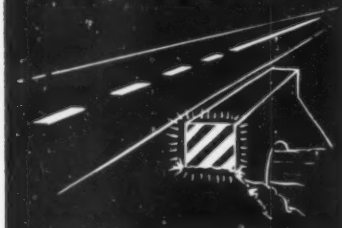
PORTLAND CEMENT ASSOCIATION

Dept. 11-89, 33 W. Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of concrete

MODERN concrete

SAVE LIVES!
SAVE TIME!
SAVE MONEY!
with
FLEX-O-LITE
Type H Safety Spheres



Assure full-time safety night or day . . . rain or shine, for just pennies per square foot with Type H Reflective Glass Beads. Applied with ordinary traffic paint to: guard rails, safety islands, bridge abutments, barricades, bull noses, curbings, fire hydrants, etc. Terrific, eye-catching brilliance. Write for details.

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MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

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LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Anatomy of a Meter

The case of *Weisenberg v. Village of Beulah*, 352 Mich. 172, decided by the Supreme Court of Michigan April 14, 1958, involved a question of *liquidated* damages, in the original sense. The decision was rendered by Justice Voelker who, under the pen-name of Robert Traver, is the author of the best-seller "Anatomy of a Murder".

At the end of the summer of 1952, C. J. Weisenberg made arrangements to close his summer cottage in the resort village of Beulah, Michigan, and then went to his home in Owosso. As he had done many years in the past, he first got permission from the village to turn off the main water valve out near the street so that he could open the faucets in his cottage and drain the pipes in order to prevent freeze-ups during the winter. After obtaining this permission, he hired a plumber to shut off the valve, drain pipes, and close the cottage. All of this was done, and the village clerk was so notified.

About a month later, the water valve out near the street somehow was turned on, and water ran through the open faucets in the cottage, causing extensive flooding and damage. More than half a million gallons of water flowed into and through the cottage before the situation was discovered.

Weisenberg then brought suit against the Village seeking recovery for the repairs and damages, based on the negligence of the village in turning on the water. The village denied that it had turned the water on, and also stated that under a prior village resolution, only authorized village employees could turn the water on and off, and that written notice of this had been mailed to all users. The plaintiff denied knowledge of the resolution, and claimed that, in any event, the village custom and practice permitted the owner of the cottage to turn the water on and off on proper notice to the village, and on its authorization.

There was no direct evidence as to who had turned the water on.

The water valve and meter were located a few feet from the public street, about 100 feet from the cottage, 2 feet below a locked manhole cover. The lock was an unusual 5-sided inset nut that required a special kind of wrench to turn it readily. There was no handle on the valve itself, and it could not be turned by the fingers alone.

Sometime after the original closing of the valve, the village water meter records were marked "off", against the plaintiff's meter. The meter reading at that time (Oct. 7, 1952) was 11,160 gallons. On Nov. 6, 1952, the next meter reading showed 597,320 gallons, as indicated on the village meter records. Since the water meter was below the locked manhole cover, it was thus evident, in the court's opinion, that a village employee who had read the meter on these two occasions had had access to the water valve. It would not be too much to presume that on the first such occasion, or possibly on a subsequent occasion, a village employee had turned the water valve on, probably on the assumption that he was turning it off.

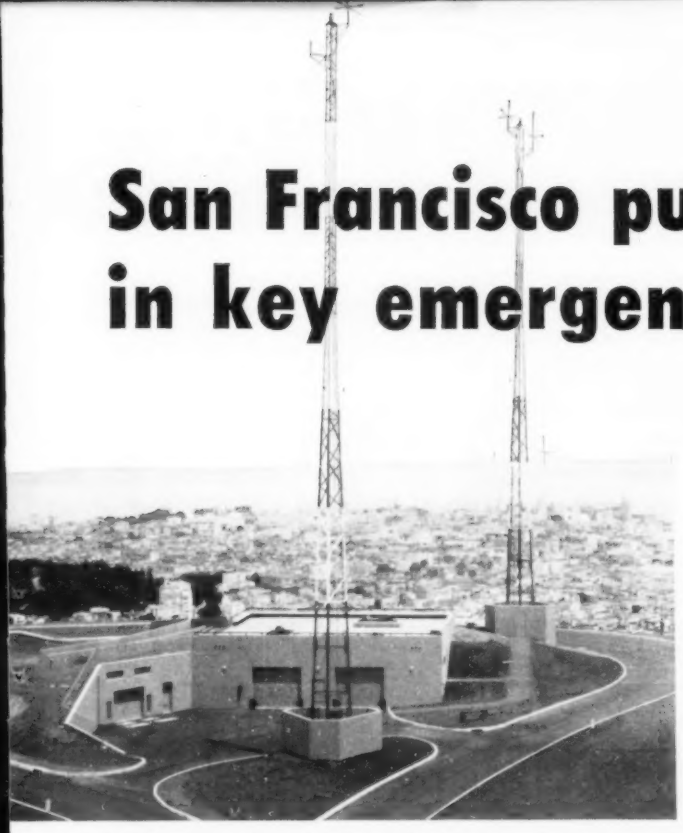
The court held that the jury could draw such an inference, and that the verdict for the plaintiff was therefore proper.

It may also be added that the selling of water was regarded as a proprietary function, and hence afforded no immunity to the village.

Down by the Old Millstream

Drainage Board v. Village of Homer, 351 Mich. 73, a case decided by the Supreme Court of Michigan Dec. 24, 1957, involved the right of a Drainage District to drain water from the Homer Mill Pond.

San Francisco puts twin U-450's in key emergency power plant



Standby power plant is located on Christmas Tree Point, highest elevation in San Francisco. U-450's shown below are sole radio transmitter power source in emergencies.

Whenever the wired power supply voltage at Christmas Tree Point in San Francisco drops 10%, two 6-cylinder International U-450 power units automatically go to work. These engines drive 50 KW King-Knight 120-volt 60-cycle generator sets that presently supply emergency power for radio transmitters used by the city police. Radio facilities for the fire department, department of public works, water department, the municipal railroad, Civil Defense and Disaster installations in the area will soon be installed here.

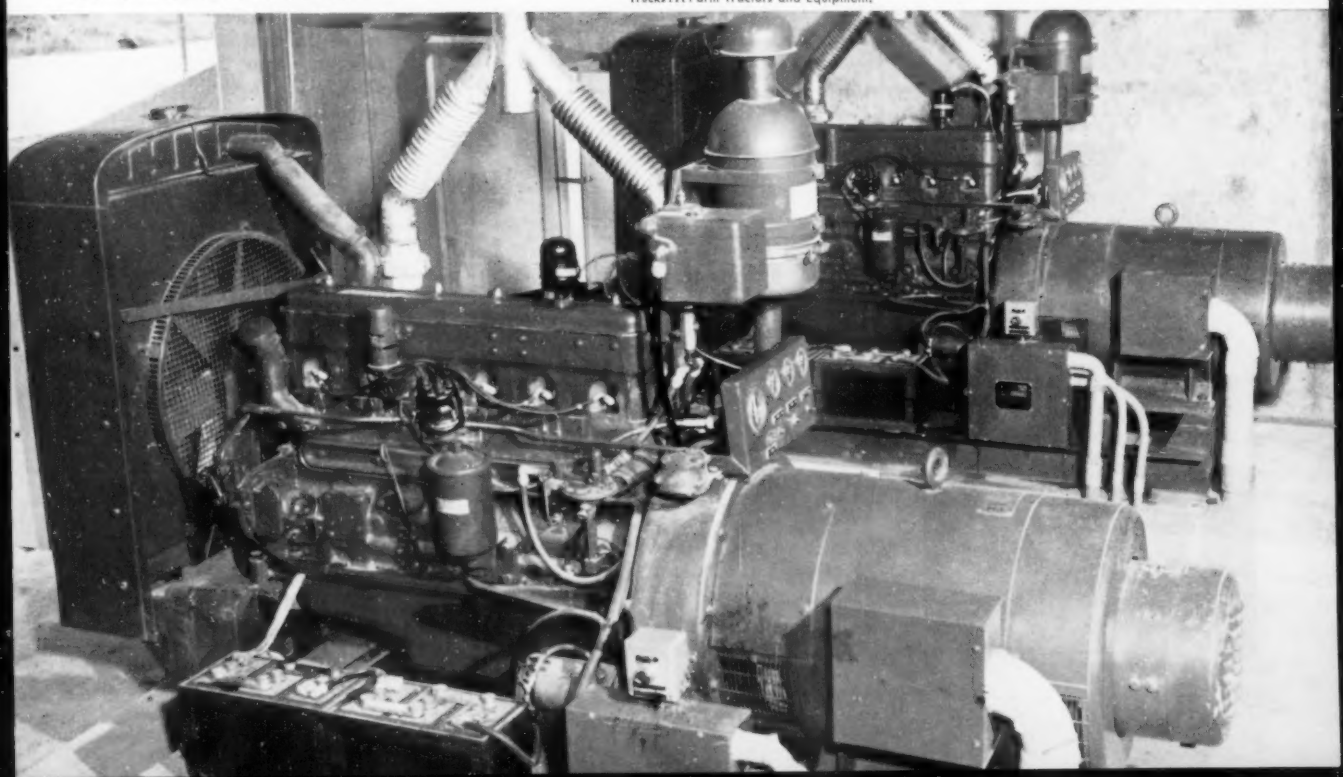
Special installation features include Jones Motorola tachometers that prevent overspeeding; and a fuel system that automatically switches the engines so both run from either a single 550-gallon tank or from separate tanks.

It's good to know that when you approve a bid for an International engine or International-powered machines or equipment, you're getting a big power buy for your tax dollars. International is the world's leading manufacturer of heavy-duty 6-cylinder engines. In addition, your International Power Unit Distributor or Dealer backs these engines with outstanding parts and service support.

International® **Construction Equipment**

International Harvester Co.
180 North Michigan Ave., Chicago 1, Ill.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors ... Self-Propelled Scrapers ... Crawler and Rubber-Tired Loaders ... Off-Highway Haulers ... Diesel and Carbureted Engines ... Motor Trucks ... Farm Tractors and Equipment.



Interesting Comparisons

For Men Faced With Increasing Demands on Municipal Water Supply

Since increased water supply frequently demands increased filtration capacity, these considerations are important to many municipal engineers.

RAPID SAND FILTRATION	DIATOMITE FILTRATION	
100%		**capital investment** Based on the actual costs of existing municipal diatomite filtration systems as compared with engineering estimates and bids for equal capacity sand bed systems for the same municipalities.
		space requirements A conservative estimate, since a diatomite filter which will deliver 300 gallons per minute may occupy no more than 20 sq. ft. of floor space. On large installations, this differential may be as high as 10 to 1.
variable	*consistently brilliant*	**clarity** Because diatomite filtration is a "micro-straining"—a mechanical process—its positive action is more dependable than the uncertain effectiveness of floc formation with coagulants as used in rapid sand units.
partial	complete	**activated carbon removal** Diatomite filtration is the only commercially practical system which removes all trace of activated carbon used to adsorb undesirable taste, odor or color.
can be serious	0	**air binding difficulties** Independent tests made by municipal engineers, using water supersaturated with oxygen, showed no appreciable effect on the efficiency of a diatomite filtration system.
up to 10% of previous run	*a few gallons*	**water required for backwashing** Reports from many municipalities show that from 2% to 10% of the previous filter run is required to backwash the sand bed.
$ = $		**operating costs** This may be considered as an "average"; individual circumstances set the actual costs in any specific installation.

Dependable GLC GREAT LAKES Dicalite DIATOMACEOUS MATERIALS

Dicalite Bulletin BW-13 contains much information on Dicalite filtration of potable water—clarity, purity, bacteria removal (95% or better) together with data and operating figures on diatomite filtration systems now operating in certain municipalities. Write for it—it's free.

DICALITE DEPARTMENT,
Great Lakes Carbon Corporation
612 So. Flower St., Los Angeles 17, California

The Homer Mill Pond was created about 100 years ago by a dam constructed across the south branch of the Kalamazoo River by the predecessors of the defendant Van Patten. The pond extends about 1½ miles, and follows the natural bed of the stream. The pond was and still is utilized by successive owners of the dam and pond flowage rights for the generation of power. The waterhead level, maintained well beyond the memory of any living witness, is 8 feet above the mean water level below the dam.

The Drainage Board proposed to eliminate, in whole or in part, the dam and pond, in order to provide better drainage of lands forming a part of the upstream watershed.

At this point, the Village of Homer supported by property owners adjacent to and bordering on the Homer Mill Pond, as well as by farmers relying on subsurface irrigation, objected on the ground that the pond has been generally utilized for public and private boating, bathing, fishing and hunting for such a long period of time, as to create prescriptive rights against the defendant Van Patten who owns the dam. Thus, they claimed that Van Patten had no right to sell his rights in the dam to the Drainage Board for the purpose of destroying it. They also claimed that the pond had become an artificial inland lake under the jurisdiction of the county board of supervisors or the conservation commission or both.

The court held, in accordance with the majority view, that the rights in the dam were solely with the owner of the dam, and not with the incidental beneficiaries upstream. The latter have no rights in the maintenance of the dam. Thus the Drainage Board can aquire the right to destroy the dam from its owner by purchase, or by eminent domain.

It was also held that the pond was not a lake under the exclusive jurisdiction of the county board of supervisors or of the conservation commission.

The result was,— as indicated by Justice Black in his opinion,— "There will be no further trysting down by the old millstream."

• • •

Sanitation Work is Dangerous

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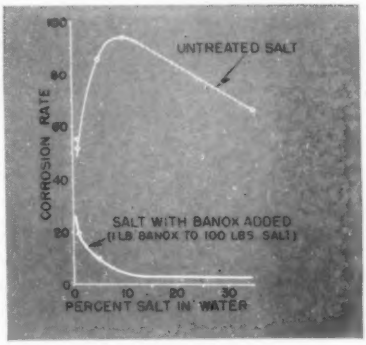

Laboratory tests show how BANOX added to salt reduces corrosion effectively in salt brines of any strength.

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ECONOMIC SELECTION OF POWER TRANSFORMERS

BRUCE J. ENNIS
Principal Engineer,
Burns and McDonnell Engineering Company
Kansas City, Missouri

AN ELECTRIC generation, transmission, and distribution system has a considerable investment in power transformers necessary to step up generated voltages to transmission levels, to step down transmission voltages to supply distribution feeder circuits and customer substations, and to operate power plant auxiliary equipment motors. Within basic limits, the manufacturers of such power transformers offer equipment having an appreciable latitude as to first cost, operating expenses and losses, type, and physical size. In many cases, there is no hard and fast choice necessary as to a particular transformer needed to satisfy the requirements of a specific situation. In other cases, the specifications for the purchase of a power transformer custom tailored to individual system requirements will permit selection of one of the many types of transformers available, which will provide the best overall economy for the particular application.

Generally speaking, the transformers for the average customer substation and for the small to medium sized distribution substation of 10,000 kva capacity or smaller, should be the "standardized" design; these offer good economy and lowest first cost due to mass, repetitive production methods permissible in the manufacture of such transformers.

For larger transformers, and transformers of a special nature or application, it is desirable to analyze transformer purchases from an economic viewpoint. This is especially true in the selection of step-up power transformers for installation in the power plant yard, to transform large blocks of power from generated to transmission voltages. Such transformers are available from manufacturers in accordance with the following American Standards Association classifications, depending on type of cooling: OA, oil-immersed, self-cooled; OW, oil-immersed, water-cooled; OA/FA, oil-immersed, self-cooled/forced air cooled (fans controlled in one group); OA/FA/FA, oil-immersed, self-cooled/forced air cooled (fans controlled in two groups); FOA, oil-immersed, forced oil cooled with forced air cooler; and FOW, oil-immersed, forced oil cooled with water cooler.

These transformers are available in various voltages and kva ratings, and as single or three-phase units. Factors which vary among the different types and designs are the first cost, losses, energy requirements for operation of auxiliary cooling fans and pumps, the amount of capacity available with and without dependence on auxiliary equipment, physical size and space necessary for their installation, and the cost of piping and wiring required for transformer auxiliaries.

Formerly, power transformers were installed as single phase units connected in a bank with a fourth transformer as a spare, emergency unit. With the vastly increased dependability of modern transformer designs and materials, it is common practice, today, to use three-phase transformers instead of banked single phase units, at a considerable saving in cost and in the space necessary for the installation of the transformation equipment.

In any given power system, there are certain conditions peculiar to that system. These include the cost of financing, the cost of generating energy; the space, or lack of space, for the installation of equipment; and the importance of the availability of major equipment. Each of these factors has direct bearing on the selection of a power transformer to give the best overall piece of equipment for the individual system. As an example of the economic selection of power transformers, let us consider two typical utilities, "A" and "B", which need to purchase a 13.2—69 kv three-phrase step-up power transformer nominally rated 42/56 mva of type OA/FA or FOA, for use on a unit plant basis with a new 44-mw turbine generator unit. Let us assume individual system conditions as follows:

Annual fixed charges, System A, 6 percent, System B, 12 percent; cost of energy in mills/kwh generated, System A, 5.5, System B, 3.5.

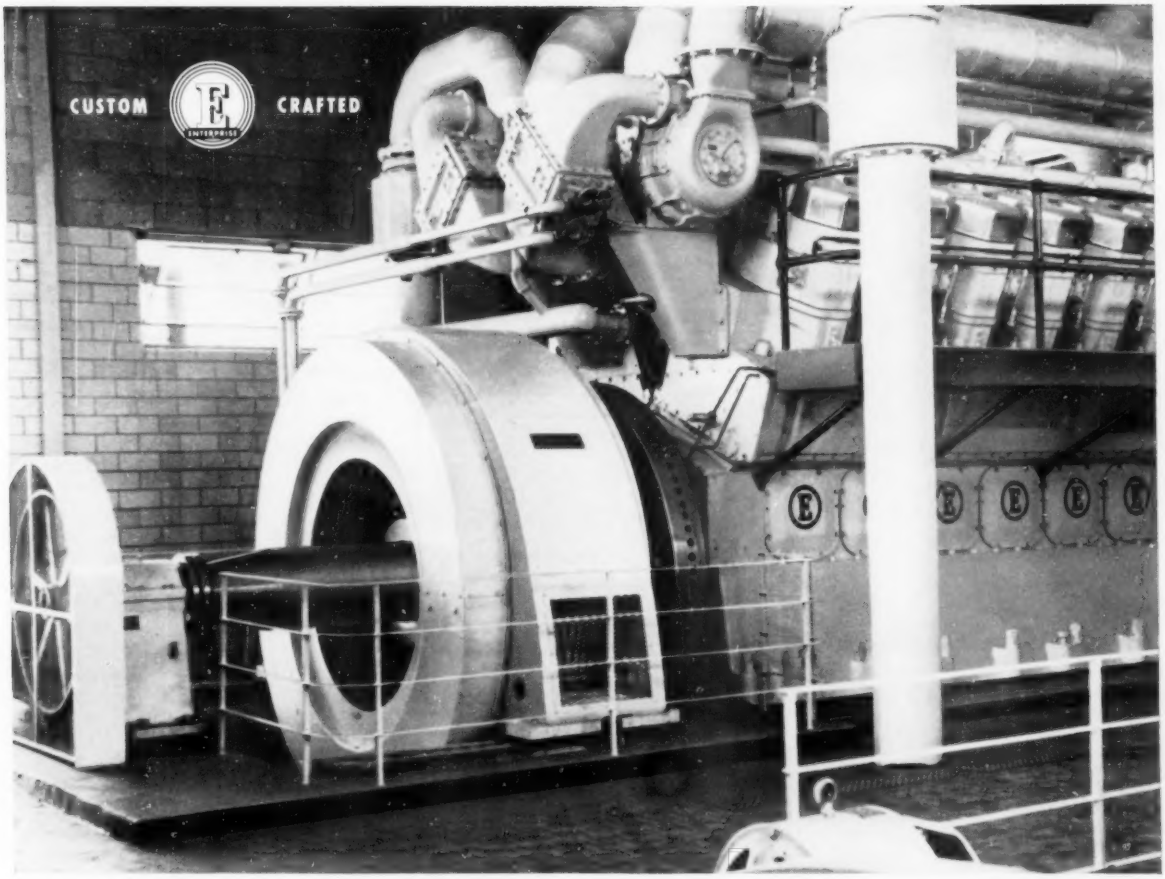
Both utilities will operate the new 44-mw turbine generator unit, through its associated step-up power transformers, on a loading cycle as shown in Table 1.

Table 1—Annual Loading in mw

	Total Hours	*44-mw*	*40-mw*	*30-mw*	*20-mw*
Average hours output	6,625	3,125	1,000	1,250	1,250
Percent loading	...	100	91	68	46
Loading factor	...	1.00	0.91	0.68	0.46
Loading factor, squared	...	1.00	0.83	0.46	0.21

Table 2—Basic Information on Transformer Types

	ASA Transformer Type	
Transformer Item	OA/FA	FOA
Rating in mva	42/56	56
No-load loss in kw	67.0	65.0
Total load loss in kw	304.0	341.0
Load copper loss in kw	237.0	276.0
OA/FA cooling fan (above 30 mw)	7.0	...
FOA pump and fan (above 30 mw)	...	19.0
FOA pump and fan (below 30 mw)	...	9.5
Installed cost	$160,000	$140,000
Installed cost max. rating	$2.86/kva	$2.50/kva



World's Smallest Big-Horsepower Engine Now at Work for Waverly, Iowa

This Enterprise 16-cylinder Turbocharged Dual Fuel Engine is now "on the line" for the Municipal Electric Utility of Waverly, Iowa. It is the largest, most powerful engine ever built by Enterprise—yet its dimensions and weight make it the world's smallest engine in relation to its horsepower output. The Waverly engine is rated 4,890 hp—3,500 kw—at 360 rpm. Top-rated capacity of the RV: 7700 hp at 400 rpm.

Located in Waverly's West Light Plant, the Enterprise unit more than doubles the previous kw capacity of this facility, and is also generating more power than the city's East Plant with its 4 engines and 3 hydro units.

As with other custom-crafted models in the complete Enterprise line, this 110-ton engine offers many advantages which cut installation, operating and maintenance costs. Less bulk makes installation easier, servicing simpler and more economical. Maintenance requires no major disassembly because all working parts are readily accessible from the outside.

Investigate this "workhorse" source of dependable, low-cost power—the result of nearly four decades of experience, research and development. Write for Bulletin ES-B69, or ask for a representative to call.

With its new 4 cycle, 17" bore x 21" stroke RV-16 *Enterprise*, the Waverly installation has become known as a "showplace among the power plants of the nation."

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Assume that no-load transformer losses are constant, and are continuous during all operating hours, and that the copper (load) losses vary as the square of the loading.

Based on information obtained from the transformer manufacturer, or from catalog data, assume basic information pertinent to the transformer types to be considered, to be as shown in Table 2.

The calculation for the economic selection of one of these transformers for System "A", would be as follows:

For the OA/FA transformer, the no-load loss would be 6,625 hrs. x 67.0 kw or 444,000 kwh. The load copper losses would be the sum of products of the average hours output at the various loads (Table 1), the respective values of the loading factor squared (Table 1), and the load copper loss of the transformer type or 237.0 kw (Table 2). This sum is 1,137,000 kwh. The cooling fan consumption for the OA/FA transformer would be 7.0 kw (Table 2) x 4,125 (the number of hours operated above 30 mw, from Table 1) or 29,000 kwh. Thus the total annual energy lost and consumed in the OA/FOA transformer would be 444,000 + 1,137,000 + 29,000 = 1,610,000 kwh.

In a similar manner, the total annual energy lost and consumed in the FOA transformer would be 1,868,000 kwh, and the economic comparison of these transformer selections would be as follows:

In System "A" using the OA/FA transformer with an assumed investment of $160,000, the annual fixed charges at 6 percent would be $9,600. At 5.5 mils per kwh, the cost of 1,610,000 kwh energy lost and consumed in the transformer would be $8,850. The annual total cost, fixed charges plus losses, for the OA/FA transformer is consequently $18,450. If the investment represented by the FOA transformer is $140,000, the annual total cost could be similarly calculated as $18,700. Thus, the additional cost of the FOA transformer is $250 per year. Using this same calculation procedure for System "B" with 12% annual fixed charges and a 3.5-mills energy cost, the OA/FA transformer is shown to cost $1,500 per year more.

From the above analysis, it may be seen that System "A" should purchase the OA/FA transformer, whereas the FOA type of transformer would be a more economical selection for System "B", based on the assumptions which have been made. Actually, if System "A" had a space problem, which would result in excessive crowding if the OA/FA transformer were installed in the station yard, then the physically smaller FOA type of transformer could be considered.

In a similar manner, System "B" might consider the purchase of the OA/FA transformer (which would have a 42 mva self-cooled rating independently of its auxiliary cooling equipment) rather than the FOA transformer (which would have no continuous self-cooled capacity rating upon failure of its cooling equipment.) The selection of the OA/FA transformer might be justified provided the possible loss of output from the FOA unit would seriously jeopardize system operations.

The final selection of a transformer best suited for the needs of an individual system will depend on all such factors, in addition to the economic comparison of the several types available. Every transformer purchase should be carefully considered to assure maximum economy for the particular system into which it will be installed.

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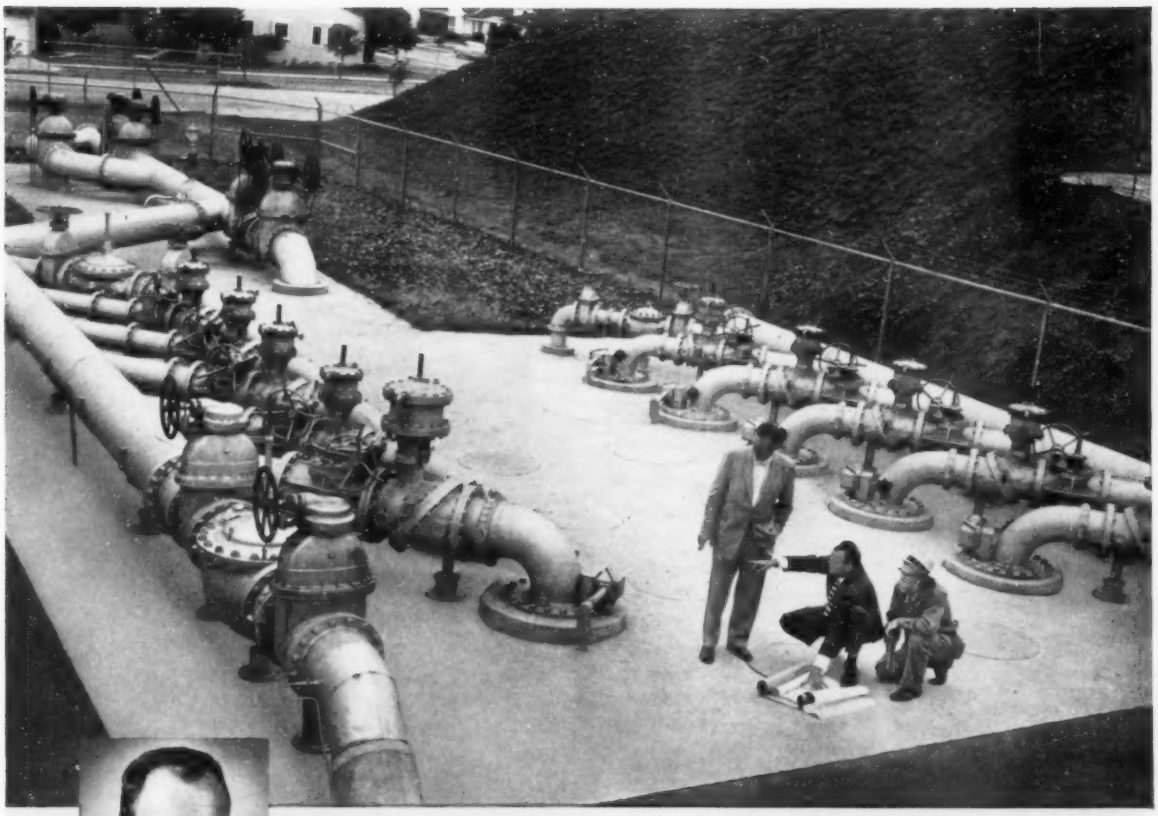

"BJ submersibles represent silent economy"

says H. W. Stokes, Water Department Director of City of Inglewood

"For over a quarter of a century, BJ Submersibles have assured the City of Inglewood a dependable, protected water supply that is so vital to our fast growing residential and industrial areas."

"Our city pioneered the installation of submersible pumps in 1930. We were the first city in the U. S. A. to use this type of pump in a municipal application. We now have 18 Byron Jackson Submersibles servicing the Inglewood water supply system."

"Because of silent operation, we install BJ Submersibles in residential sections with no fear of noise complaint. Space economy and the fact that no pump house is necessary keep our real estate investments to a minimum. Savings to the taxpayer on installations of this type have been substantial over the years."

"We are justifiably proud of our latest BJ Submersible booster plant. Located in the heart of a residential section, this installation of 10 Submersibles represents a total of 635 HP in an area of 30′ x 50′. The five pumps, serving the low pressure at 20 to 35 lbs have a total output capacity of 14 million gallons per day. The five pumps serving the high pressure system at 60 to 75 lbs have a total output capacity of 10 million gallons per day. This booster system, operated automatically, maintains pressure in the city's water system for our new 15 million gallon reservoir.

During a heat wave in September of 1955, daily water requirements for our city of 60,000 rose to 50% above our previous all-time high. This represents the difference between 12 million gallons maximum daily consumption and the emergency figure of 18 million gallons daily.

"Our automatic control system that permits actuation of individual pumps as requirements rise, functioned perfectly in meeting this tremendous increase."

Write for our new 12-page Submersible Bulletin.

BYRON JACKSON PUMPS, INC.

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SINCE 1872

"Cuts maintenance to the bone"

AND IT'S TASSCO FOR SIGNS

The signs, provided by Traffic & Street Sign Company, are the new Increment Sheet Signs. The faces are in strict accordance with the Federal Interstate Highway Signing Manual. In this way, P & K and Tassco, associated companies, provide a unified responsibility for the entire program.

This is North Carolina's new Interstate Highway Route 40. Since, under the terms of the construction program, North Carolina is to maintain the road, the State specified those materials which would keep such costs at an absolute minimum. Their choice was Pfaff & Kendall's all aluminum sign spans and Traffic & Street Sign Company's increment sheet signs with tapered aluminum supports. Thus, with 9 large sign spans, 1193 signs, and 501 sign supports, not one drop of paint is required for maintenance!

Take the sign span in the photo for example, 90 feet wide, it bears nearly 500 square feet of sign, and without a center support. Yet it provides all the strength demanded—enough to withstand 100 mph winds—yet light enough in weight to have made installation unbelievably easy. As a matter of fact, it took only eight minutes to erect the 90-foot truss section! As for maintenance, there is none. The good-looking aluminum span never needs painting, not at installation or at any other time.

For any signing program, there's a wealth of helpful data available through the Tassco-P & K Highway Planning Committee, including a full color movie of the North Carolina program. This service, as well as the planning assistance of the Committee is available without charge to all State Highway Depts. Address your requests to "Committee."

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1455

"I'm Steven Kocur, Superintendent in Town of Carroll, N. Y.

We bought our No. 955 Traxcavator because we knew of Caterpillar's dependability. We've had a minimum of maintenance worries and the operation of the No. 955 is very economical. This machine has saved the township a lot of time, labor and over-all operation costs. It is indispensable to our snow removal work--loading trucks after streets have been plowed. Our streets now are cleaned in record time."

But snow removal is only one part of the story. The No. 955 Traxcavator has proven itself to be an all-year, all-around unit. The township also uses it for loading gravel, building sluices, laying tile, backfilling and maintaining ditches.

The No. 955, which is also used as a crane, recently unloaded 20 tons of bridge material in 30 minutes with an operator and one other man—an operation which once required a full crew working all day.

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Somewhere today you have a job that could be done faster and more economically with one of the three sizes of Cat-built Traxcavators. Your Caterpillar Dealer will be glad to show you on *your* job how you can save tax money. And remember, you can always count on him for fast, dependable service and quality parts you can trust.

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VOLUME 89, NUMBER 11

PUBLIC WORKS MAGAZINE

NOVEMBER, 1958

● FIRST step in improving a street is to patch holes and smooth surface. Here a city crew is preparing for seal coating.

City Establishes FIVE-YEAR STREET MAINTENANCE PROGRAM

GEORGE H. FELLOWS,

Director of Public Works, Pueblo, Colorado

PROGRESSIVE cities no longer can be allowed to "just grow". Long-range planning is necessary, and city planners must have knowledge of the past and faith in the future of a community.

Pueblo, Colorado, (Pop. 110,000) since 1950, has emerged rapidly from the dusty street era. During the economic depression in the 1930s, the taxpayers defaulted in payment of special assessment bonds, causing bonding companies to shy away from handling Pueblo bonds for street paving.

But citizen action in 1949 saw charter amendments adopted and the Council-Manager form of government approved. An entire new charter was adopted in 1954. The 1949 and 1954 changes in government enabled Pueblo to market street paving assessment bonds and guarantee payment through a general levy, if necessary. The citizens thus gave notice that they were ready to rid themselves of dusty streets. In 1953, for example, 16.2 miles of new paving were constructed. From 1953 to 1958, a total of 75.3 miles of new paving were added to the city's street maintenance program. The many miles of older surfaced streets and the newer ones led to the need for a planned street maintenance program.

Pueblo has 256 miles of streets open to traffic within the city limits. Of this total, 170 miles have some type of all-weather paving. The paving varies from road-mix asphalt on no base to a high-type asphaltic concrete on a crushed rock base and concrete pavement.

Before a street maintenance program could be decided, a survey was necessary. In the fall of 1957, the Pueblo Street Superintendent and Director of Public Works surveyed every street in the city to plan a five-year maintenance program for all surfaced streets. A novel method was used in making this survey. A Revere tape recorder capable of recording 1,200 feet of tape on one reel was installed in a city automobile. As each city block was examined, the remarks on the condition, proposed maintenance and year the work should be done was recorded on the tape. After completing a roll of tape, the remarks on each block were transcribed onto work sheets. The Engineering Department then prepared a map showing the

different classifications and schedule of proposed maintenance by using a color code.

The survey revealed the following maintenance should be planned during the next five years: 180 blocks will be seal coated in 1958; 185 blocks should be seal coated in 1959; 537 blocks should be seal coated in two to five years; 10 blocks should be resurfaced in 1958; 10 blocks should be resurfaced in 1959; 80 blocks should be resurfaced within two to five years; and 15 blocks should be reconstructed within five years.

It is evident that various types of street maintenance are recommended. The types vary from an inexpensive seal coat, or armor coat, to the expensive resurfacing and reconstruction of the street.

The type of maintenance recommended for each street depends upon several factors, such as 1) type of original construction, 2) type of failure or surface distress of the street, 3) amount of traffic the street carries and 4) the type of traffic on the street.

Seal Coating

Seal coating is recommended where it is necessary to seal cracks in the pavement to moisture, and to correct surface distress conditions. This consists of applying liquid asphalt to the street surface followed by a cover aggregate. An Etnyre distributor of 1,000-gallon capacity is used for spraying an RC-4 cutback asphalt at the rate of about 0.2 to 0.3 gallon per square yard. The actual rate used is determined by the Street Superintendent. It depends on the amount the street will absorb and still provide enough asphalt for retention of the cover aggregate.

Asphalt is delivered to the city by truck transport from a refinery in quantities of 4,000 to 5,000 gallons. Delivery specifications call for the asphalt to be delivered within the recommended spraying temperature. The cost of RC-4 cutback asphalt delivered in Pueblo is approximately 12¢ per gallon.

Pueblo uses two types of cover aggregate. One is a sand or gravel chip, the other a crushed slag chip. The gradations are shown in Table 1.

Table 1—Gradation of Cover Aggregate

Sieve Size	% Passing by Weight Sand Chip	Slag Chip
$\frac{3}{8}$-inch	100	100
No. 4	85-100	0
No. 8	20-50	
No. 16	0-25	
No. 50	0-5	
No. 100	0-1	

The choice of chip for the most part is an economic one. However, other considerations enter into the picture. The crushed slag chip gives much more skid resistance to the street surface. It also is more dust free under traffic conditions. Crushed slag chips meeting the gradation cost about $3 per ton in the stock pile. Sand or gravel chips meeting the gradation cost 90¢ per ton in the stock pile. The slag chip has been used generally in commercial and business areas to keep the number of dust complaints to a minimum.

Comparison of material cost per square yard for seal coating a street, using the two different cover aggregates at the rate of 22 pounds per square yard and asphalt at the rate of 0.25 gallon per square yard, is: SAND CHIP—asphalt $0.03 and sand $0.01 for a total cost of $0.04 per sq. yd.; and SLAG CHIP—asphalt $0.03 and slag $0.033 for a total cost of $0.063 per sq. yd.

Resurfacing a street is recommended where an additional thickness of asphaltic concrete is needed for a wearing course, sealing the cracks and correcting bad riding qualities. This consists of laying a thickness of asphaltic concrete of one to two inches over the existing surface of the street. A heater-planer planes off all corrugations and improves the street's riding qualities. Leveling courses of the same resurfacing material also are constructed to improve riding qualities over depressions. Merely resurfacing an old surface will not guarantee a "new" street to the people.

Prior to resurfacing or constructing leveling courses, it is standard practice to "tack" the street with a light application of liquid asphalt (generally 0.05 to 0.10 gallon per square yard of MC-O or MC-1) and allow this to dry. The purpose of the tack, or prime coat, is to bond the new mat to the old surface.

A maximum size of $\frac{3}{4}$-inch crushed gravel or slag is used in resurfacing material. The gradation of the aggregate is as follows: 100 percent passing the $\frac{3}{4}$-in. sieve; 30-60 percent passing the No. 4 sieve; 20-45 percent passing the No. 10 sieve; and 6-12 percent passing the No. 200 sieve.

Pueblo does not own its own asphalt plant. But a commercial plant operates and sells asphaltic concrete to the city for resurfacing and patching at the bid price of $4.60 per ton at the plant. Figuring one ton of asphaltic concrete will cover 18 square yards of one-inch thickness or 9 square yards of two-inch thickness, the price of material alone will vary from approximately 25 cents to 50 cents per square yard.

Street Reconstruction

Reconstructing a street is recommended where the existing street shows signs of failure or has failed completely as to base and asphalt surfacing. This amounts to removing the old asphalt and base material, if any, and rebuilding a new base and asphalt mat. This is the most expensive type of maintenance for a city. Pueblo does not rebuild new

● **HEATER-planer is used to remove bumps and corrugations. This improves riding quality of the finished surface.**

● **SAND CHIPS are spread on residential street following application of RC-4 asphalt during the 1958 seal coat work.**

streets with its own forces. Contracts are awarded on the basis of competitive bidding, required by city charter, for all reconstruction. Prices vary from $1.35 to $1.75 per square yard complete in place, depending upon the amount of base required.

Pueblo has many miles of concrete pavement in need of maintenance. A bad soil condition in one section of the city has caused a differential heaving and settling of the concrete paving. Some of these blocks will be resurfaced with asphalt and others will be reconstructed.

● **PRIOR TO resurfacing, heater planer is used, followed by patching and placement of leveling courses, to insure pavement to be surfaced is smooth and even.**

Not all paved streets will require maintenance in the next five years. About 950 blocks of asphaltic pavement and 60 blocks of concrete pavement are in good condition and should be trouble-free for at least five years, our survey indicates.

The city has about 750 blocks of graveled and dirt streets. It is from that group that most of the street improvement districts are formed. Those streets are graded and graveled several times annually.

A street maintenance program has its problems. It is one problem to inspect each block and plan the improvement program. It is another problem to find funds to finance adequately a planned program because none of the cost is assessed against the abutting property owners. In past years, Pueblo, as many other cities, budgeted funds for street repairs based on what the city used for maintenance the previous fiscal year.

In 1955, the taxpayers approved a one percent retail sales tax to finance public improvements and for increased revenue for general municipal costs. Most public work projects are financed from the sales tax revenue (averaging $700,000 per year).

It always is a problem for the Director of Public Works to convince the City Finance Officer, City Manager and 7-member City Council that his department should receive sufficient funds. But with a planned maintenance program, the prospects of having sufficient funds appropriated are improving. In case certain projects may have to be eliminated to meet budget restrictions, a priority system is determined for the work planned for the year.

Street patching goes on the year-around. An average of 12 tons of asphalt patching material is used per working day to patch holes and plumbers' service cuts in the streets. The water works and the natural gas firm hire private contractors to patch their street excavations. Patching material costs the city about $15,000 per year.

Seal coating of city streets must be done every year. After patching, seal coating of streets has first priority. This is due primarily to the fact that seal coating a street when it needs it can help prevent major expenditures at a later date. Also, seal coating can be done at a fraction of the cost of other types of maintenance.

Resurfacing city streets is next in priority, followed by reconstruction. In case of a priority within a maintenance classification of seal coating, resurfacing and reconstruction of a street, consideration is given to the amount of traffic and the use of the street. Arterial and business streets are given priority over local streets in all classifications.

A city receives many benefits from a planned maintenance program. The work schedules of the various street department crews can be planned more efficiently because the street superintendent knows in advance which streets are to be improved and the type of maintenance proposed.

Operations of various city departments normally are carried on at the same time. Therefore, planned operations should be such that the work schedule of each department is directed toward best efficiency. For example, by notifying the traffic division of streets to be seal coated or resurfaced, that department can schedule the painting of lines and markings to be done after street maintenance is completed.

A planned maintenance program helps immeasurably in preparing budgets because the number of streets to be repaired and the year the work is planned are known in advance. This permits budgeting for street repairs in terms of specific askings instead of trying to spread so much money over so much area. If a budget has to be reduced for economy reasons, the administration can eliminate certain projects.

Giving a street proper maintenance at the right time reduces the overall costs of maintenance. Streets permitted to go year after year with no maintenance may have to be reconstructed completely at a later date. The large expenditure required for reconstruction may be prevented by regular, routine maintenance.

Using a planned maintenance program, the City Public Works Department can notify the various utility companies of streets to be repaired during the year. The utility companies can be asked to complete any planned repairs or adjustments to their lines prior to the street improvement. That eliminates unnecessary excavations, improving the public relations between the citizen, city and utility.

A good plan should be flexible to allow for unpredictable circumstances. It is impossible to guess future weather conditions, or where water or gas mains will break, or where utility companies will excavate in good streets. Therefore, any five-year maintenance program must be subject to change from year to year. Streets should be checked each year to correct unforeseen difficulties and keep the maintenance on a planned basis.

The end result of any planned maintenance program is improved streets throughout the city. Each street is given its share of attention in accordance with its needs. Local citizens know of the improved street conditions. Visitors passing through the city are impressed favorably with good streets.

PROGRESS AND COST DATA IN OHIO'S PROGRAM FOR WATER POLLUTION CONTROL

E. B. RANSOM,

Assistant Sanitary Engineer, Ohio Department of Health

TWO SIGNIFICANT dates stand out in Ohio's pollution control program. One is June 30, 1948, which was the ceremonial signing in Cincinnati, of the Ohio River Valley Water Sanitation Compact by the Governors of eight states. In it, each of the states pledged to the others faithful cooperation in the control of future pollution and abatement of existing pollution in the Ohio River and its tributaries. The eight states are Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia.

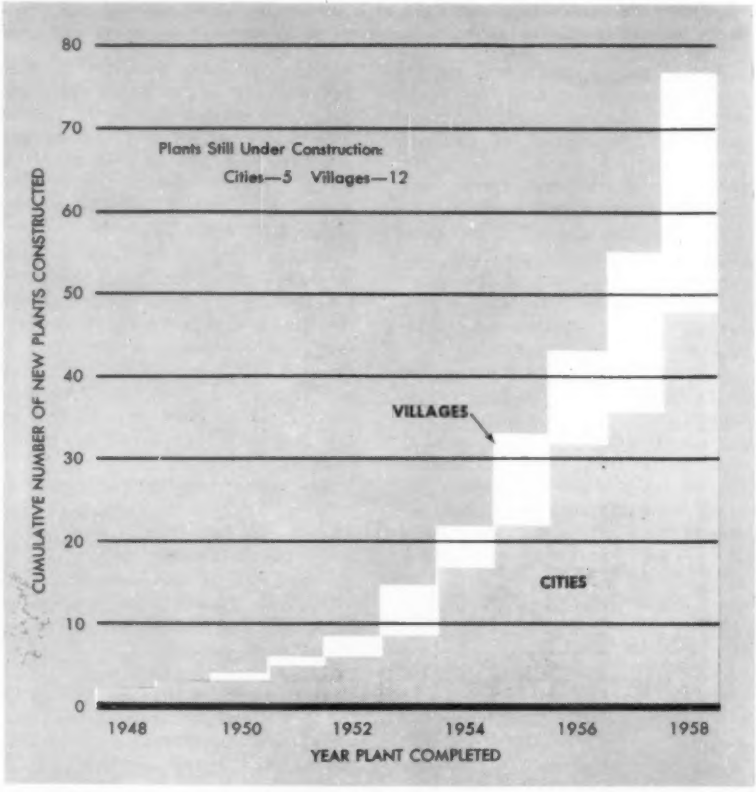
The second important date is September 27, 1952, when the Ohio Water Pollution Control Law, passed by the 99th General Assembly, became fully effective. This Law established the Water Pollution Control Board in the Department of Health, and provided the necessary legal backing effectively to combat pollution of the waters of the state.

The original authority relative to stream pollution was given to the Ohio Department of Health in 1908. This authority was amplified and extended in 1919, 1921, 1935, 1945 and 1949. However, this authority was inadequate to cope with offenders, particularly those discharging into the Ohio River itself.

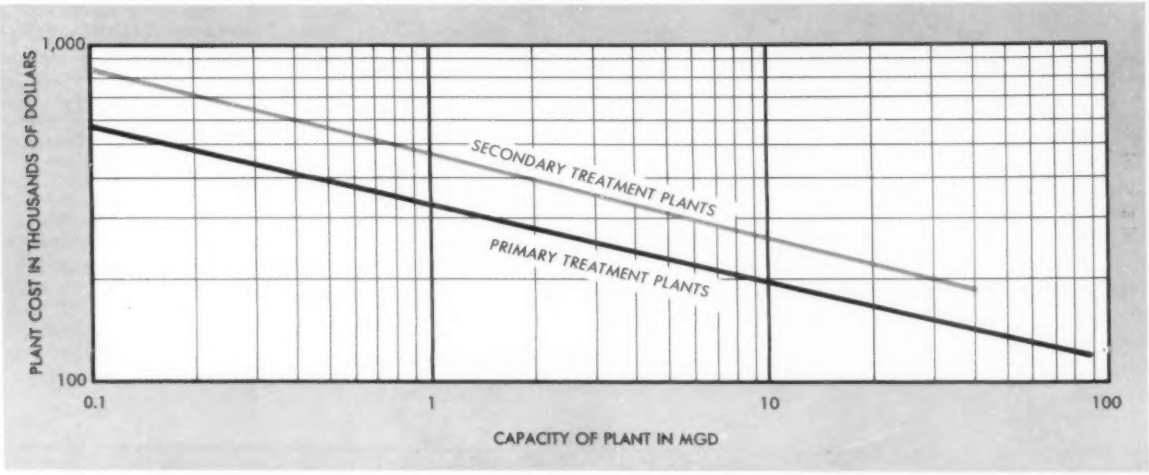
Pollution control advocates, in the Ohio River Basin, had worked for years to form a compact to combat effectively interstate pollution. Enabling legislation to permit the states to form an interstate compact against pollution was passed by the 74th Congress in 1936. The first organization meeting of representatives of Ohio, Indiana, Kentucky, Illinois, Pennsylvania, New York, West Virginia and Tennessee met to work on the compact at Cincinnati on November 20, 1936. They met five times from November, 1936, to October, 1938. During the negotiations, Tennessee was dropped, with the consent of Kentucky, and Virginia was added at the request of West Virginia. From the outset, F. H. Waring, chief sanitary engineer of the Ohio Department of Health, served as secretary of the organization group and continues today as secretary to the Commission.

The negotiating commission came to an agreement on a compact to be submitted to their eight legislative assemblies in October, 1938. The next step, getting formal approval of the compact by each state, was a long one. Ohio passed enabling legislation that was approved by the Governor on May 29, 1939, but it was 1948 before all eight states had approved the compact.

To fulfill Ohio's obligation to this compact, the legislature, in 1951, passed the Water Pollution Control Act establishing the Water Pollution Control Board in the Department of Health. The Board is made up of five members as follows: The director of health, director of natural resources, director of commerce; and two members appointed by the Governor, one which shall be experienced in the field of municipal government and one shall be experienced in the field of industry.



● **DIAGRAM shows the number of waste treatment plants constructed in Ohio during the 1948-1958 period by cities and villages. Under construction are 17 other plants.**

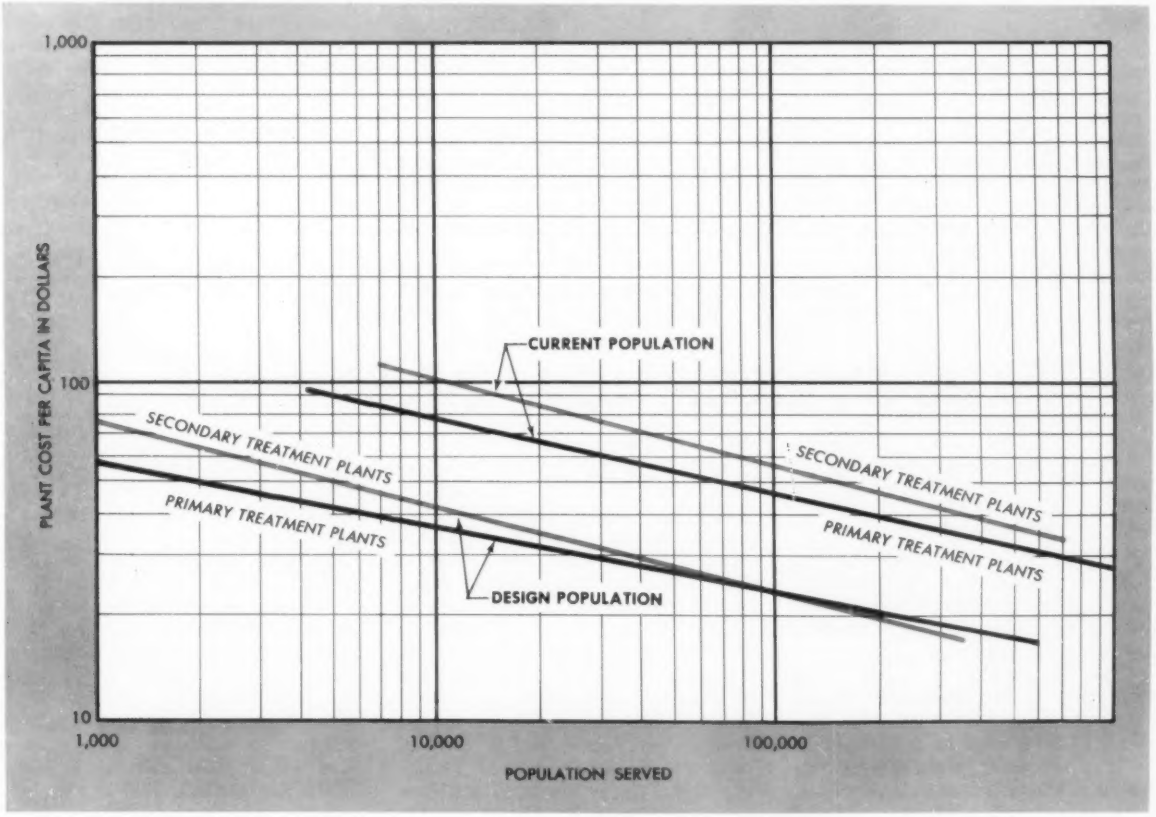


● **ABOVE: Costs per MGD of design capacity. BELOW: Costs based on design and current populations served by plants.**

In accordance with the Law it is necessary that the Board require permits to be obtained by all municipalities, counties and industries discharging sewage or industrial wastes into waters of the state. In issuing the permits, the Board stipulates certain conditions therein. The purpose of these permits and conditions is to require permit holders to take specific steps toward planning and construction, as well as satisfactory maintenance and operation, of sewage and waste treatment facilities. The permits are issued for various periods of time (up to a maximum of two years) depending upon the reasonable time required to satisfy the conditions of the permit.

Since the signing of the eight state compact, ten years ago, and particularly since the Ohio Water Pollution Control Board became active, almost six years ago, municipalities in the state have been stimulated to show remarkable progress in water pollution abatement through the construction of sewage treatment plants.

In Ohio, a village is a municipality of less than 5,000 population, automatically becoming a city upon reaching this figure. During the last ten years, 48 cities, and 77 villages, for a total of 125 municipali-



Cities That Built Secondary Treatment Plants 1948-58
Total 20 Cities

	Per Capita Costs Current Pop.	Per Capita Costs Design Pop.	Costs per mgd Design Capacity
Average	$54.1	$36.1	$357,000
Maximum	77.8	51.0	581,000
Median	55.0	35.1	351,000
Minimum	33.0	22.4	213,000

Villages That Built Secondary Treatment Plants 1948-58
Total 44 Villages

	Per Capita Costs Current Pop.	Per Capita Costs Design Pop.	Costs per mgd Design Capacity
Average	$83.8	$61.1	$629,000
Maximum	229.0	129.4	1,294,000
Median	73.2	57.0	598,000
Minimum	36.8	28.7	282,000

Cities That Built Primary Treatment Plants 1948-58
Total 27 Cities, 28 Plants

Average	43.8	32.1	240,000
Maximum	84.2	55.3	416,000
Median	44.1	30.6	244,000
Minimum	19.1	13.3	108,000

Villages That Built Primary Treatment Plants 1948-58
Total 29 Villages

Average	62.8	44.4	450,000
Maximum	120.4	75.7	757,000
Median	61.8	42.3	458,000
Minimum	23.9	29.7	108,000

ties, have built new waste treatment plants; 26 cities and 19 villages for a total of 45 municipalities have rebuilt existing plants. It is interesting to note that during this period approximately $89 million were spent for new sewage treatment plants and $55 million for rebuilt plants for a total of $144 million. Additional projects now under construction and including costs for land, engineering, etc., give a total of $250 million spent for sewage treatment in Ohio during this period.

A study was made of plant costs which was limited to the cost of construction of the treatment works and excluded all interceptor, trunk and lateral sewer costs. Either bid prices or final payments to contractors were used, excluding land costs, engineering, legal and financial costs during construction. All cost figures are adjusted to Engineering News-Record (1913=100) index as of January, 1958.

Herewith is a tabulation showing per capita costs for cities and villages with primary and secondary plants based on current population and design population. Also included are costs for million gallons per day design capacity. The cost figures include average, maximum, minimum and median. These figures include cost of extra capacity for industrial wastes in some municipalities. This will make some costs per capita based on current population appear high but on the basis of design population a readily comparable figure results.

Also shown are correlation plots of the cost data on logarithmic paper for primary and complete treatment plants based on cost per capita current population and design population and cost per mgd design basis. These cost figures are valuable in comparing one municipality with another. Accurate up-to-date per capita costs permit good approximation estimates to be given by the water pollution control agency to municipal authorities in the absence of any preliminary studies.

Such per capita costs serve to prevent and to checkmate wild estimates often promulgated by local people opposed to sewage treatment works. Likewise, sometimes deliberate efforts by municipal authorities to claim financial hardship or inability may be circumvented by use of these data.

IT'S FUN TO PLAY IN SYLACAUGA, ALABAMA

WILLIAM J. DUCHAINE,
American Playground Device Co., Anderson, Indiana

SITUATED in the heart of the new industrial south, Sylacauga, Alabama, is living up to its Chamber of Commerce slogan, "The City of Happy Living."

This community of about 15,000 population has a supervised recreation program that would be the envy of cities twice or thrice its size.

It is done on a modest budget. The secret is whole-hearted support from service clubs and other civic-minded groups and individual citizens; and, a well-planned and efficiently executed schedule of indoor and outdoor activities that keeps Sylacauga folks, young and old, busy and happy the year round.

The city has 7 parks, each containing playgrounds equipped with American swings, slides, see-saws and other apparatus; 6 illuminated Rubico tennis courts; several lighted baseball diamonds and a football field; a large swimming pool; 3 wading and 2 spray pools; a 200-acre municipal lake, and 2 recreation buildings. The centers each consist of club rooms, a large lounge, auditorium stage, gymnasium - dance floor, kitchen, offices, showers and other facilities.

Last year, the city council appropriated $16,731 for recreation. This was supplemented by $10,282, donated by the largest of the community's 40 industries—Avondale Mills. This provided an operating budget of $27,013. In addition, some money was made from renting a room in the Recreation Center to a profes-

sional dance teacher one afternoon a week. Revenues from check room receipts, coke and candy vending machines, and other sources added to the fund. All together, $31,039 was expended for recreation last year, of which $20,374 went for salaries.

During the summer season, Sylacauga's recreation staff increases from 4 full-time and 3 part-time workers to a total of about 30. Directing its extensive operations is Superintendent Beth Wallace Yates. Mrs. Yates, a graduate of Alabama Teachers College, started as a part-time recreation leader. She found the work much to her liking and has been active in this field about 15 years. As one who firmly believes recreation is a high quality product, she has been able to sell it to the community.

Mrs. Yates' theory is that service clubs and other civic-minded organizations are always looking for worthwhile projects. "Many people who visit us express the wish that civic clubs in their own communities would show interest in their recreation programs," she explains. "I think those people haven't invited the clubs to participate, because most clubs are looking for something to do."

Appropriated funds have been used to meet only the operating budget. All swings, slides and other playground equipment for the 7 parks have been donated by the civic clubs, such as Rotary, Kiwanis, Lions, Exchange, Pilots, Civitans, Jaycees and Jaycee Auxiliary.

This spring, Mrs. Yates decided to convert a storage room at the main recreation center into a teen-age room. There were no funds in the budget for this purpose, but in a short time, five women's clubs and several men's groups had made contributions.

● **ONE OF many play areas in the city, the Sylavon housing development.**

● **OUTDOOR swimming pool, 45 by 105 feet in size, is one of the most popular of Sylacauga's recreation spots. There are swimming classes and life saving courses.**

Park Development

The Noble Park project, a few blocks from the business district, was a 10-acre scrub oak woodland. City work crews cleared the area of underbrush and farmers at the outskirts of Sylacauga donated field stones and rocks. Service clubs staged a series of workbees and had a lot of fun building a picnic shelter. Then, they tackled other projects. "Before long," Mrs. Yates explained, "we had a wonderful park complete with barbecue pits, picnic tables with marble tops from Sylacauga's famous quarries, a wading pool, game tables, and a complete set of floodlights and poles."

The 40 by 75-ft. shelter at Noble Park can seat 200 at picnic tables, and is reserved for every Sunday of the following year. Exceedingly popular with Sylacauga citizens, this outstanding picnic area is attracting some of the tourists who travel in this region. Situated at the junction of the Chicago to the Gulf route, Highway US—231 and the East-West turnpike, US—280, and on Alabama state highway 21, Sylacauga has for some years enjoyed the economic benefits of tourists. Since it is located only 50 miles southeast of Birmingham and 63 miles north of Montgomery, the community also draws considerable travel from the surrounding region.

Recognizing the possibilities of Noble Park as a recreational area, the Rotary, Civitan, Exchange, Kiwanis and Lions clubs donated more than $2,000 last year toward the installation of a miniature railroad. This children's attraction now draws families from miles away.

Community Cooperation

There are many other fine examples of community cooperation to provide better recreational facilities. Mrs. Yates tells about one of these: "We were most eager to open a

● **THE recreation superintendent, Mrs. Beth Wallace Yates (left), confers with staff member Maxye Veazey, who has charge of ceramics and teen-age work in Sylacauga's recreation department.**

playground in a crowded residential area. The city owned one small lot in this area which they had purchased: a 23-foot square area was used for a gas regulator station which had been placed in one corner of the lot. The lot adjoined a very large vacant lot, which belonged to one of our generous citizens. We contacted him and asked to 'borrow' his lot. Playground equipment, a spray pool and a shelter were placed on the city-owned property. The borrowed area was used for softball, volleyball, deck tennis and other games. This is the sixth year we have used this playground. The owner has promised to give the city a chance to buy the property when he decides to sell it, and, in the meantime, it is certainly answering a great need for play space—all free of charge."

The recreation department borrowed another plot of land from another interested citizen in 1955. The department keeps the grass cut, the equipment painted and a group of children busy on what would be a lot grown up in weeds.

Even the community's youngsters get the cooperative spirit. One of the playgrounds was being damaged by erosion. Every rain took more dirt and made more ditches. But, there were many rocks in the area, so the children engaged in a rock picking-up contest. Grouped in six teams, the boys and girls picked up enough rocks in one week to build a wall the entire length of the playground. The City Street Department erected the wall with the rocks collected, and then leveled the area. Since then, the people living in the area have built a wading pool and a 40 by 60-ft. cement multiple use area. They held ice cream suppers in the neighborhood to raise the needed funds for the projects.

"The maintenance departments of the City of Sylacauga," Mrs. Yates explains, "do much to assist the recreation department. If we want lights on a playground, the electrical department furnishes the labor. The street department does many repair jobs as well as other things; so does the water department. We do not pay for these services."

Sylacauga has a comprehensive recreation program for all seasons of the year. Trained leaders work every summer on the 7 playgrounds. In addition to softball, hop scotch tournaments, story telling and so forth, a special event is held on each playground once a week. This is held at 7 p.m. and the parents get as much fun out of it as the children. The events include a fashion show with the children wearing their mothers' clothes; a pirate treasure hunt; a hobo picnic; a space men's flight; and an Indian pow wow where children cook ears of corn in a big iron pot over a fire. Each special event is followed by cartoon movies.

The outdoor swimming pool, 45 x 105 feet, is one of the most popular spots in Sylacauga from May 15th until school begins in September. An admission fee of 10 cents is charged for persons under 18 or as long as they are in school. Persons over high school age pay 25 cents.

Here is the usual schedule at the swimming pool: 8 to 10 A.M., swim classes; 10 to 11:30 A.M., competitive swim practice; 11:30 A.M. to 1 P.M., synchronized swim practice; and 1 to 8 P.M., open to the public.

In addition to the swimming classes, there are courses in junior and senior life saving. Local swimming meets are held, and Sylacauga enters teams in the East Alabama and Alabama State meets. The synchronized swimming groups present annual water shows, which, with their precision swimming, costuming, lighting and scenery, are events that attract large crowds of spectators.

The five tennis courts are lighted. Sylacauga is host each year to the state high school tennis meet and to the Cotton States Tennis Tournament. Free tennis lessons are given to boys, girls and adults. Local tennis tournaments are held for all ages.

All during the summer, the 7 playgrounds are active with the small children playing on swings, slides, castle towers and other apparatus; volley ball; Little League and Babe Ruth League baseball; softball for young and old; and other games.

In winter, recreation goes indoors to the two large recreation center buildings. These were built by the Federal government during World War II for the benefit of defense workers in the area, and were later acquired by the city. Indoor activities include dancing, basketball, boxing, table tennis, volleyball, bridge and other card games; movies, home talent shows, teen-age club socials, and many other events. Special programs are also arranged for the meetings of the elderly folks, who are organized in their Senior Citizens, Three Score and More, and Golden Age Clubs.

For young and old, there are hobby and self-betterment programs, such as classes in personal grooming, ballroom dancing, vocational guidance, painting and ceramics. Some outstanding work has been done in ceramics under the supervision of Maxye Veazey, who is also in charge of teen-age work. Last year, participation in Sylacauga's crowded calendar of indoor and outdoor activities totaled 253,945. Not a bad turnout for a city of 15,000.

● **COMPREHENSIVE recreation program includes events for all ages, from the very young to members of the Golden Age Club. Here a group enjoys a lively square dance.**

MAINTENANCE

● PLANTINGS are shown at the abutment of the overhead bridge, which are treated with chips, and in center background. Location is crossing of Indian River Road.

# of Roadside Development Plantings on the Connecticut Turnpike

OPENED on January 2, 1958, the Connecticut Turnpike is unique in several ways; 53 miles of it comprise the nation's longest continually lighted expressway; and its urban and suburban mileage are one of the longest.

Although 6000 families had to be moved at State expense, there was a sound reason for locating the highway in areas of high density. The State Highway Department wants to encourage commercial traffic away from crowded U. S. Route 1, and truckers do not want to fight highway traffic getting to downtown areas to make deliveries. Experience has shown also that shopping centers tend to spring up at outlying interchanges when new expressways skirt cities and towns. Furthermore, because toll highways usually require local traffic to be financially successful the new Turnpike has 90 interchanges, averaging one every 1.3 miles.

The Turnpike runs adjacent to a railroad, its principal competitor, for much of its distance. Other parallel competition includes the Merritt Parkway and, of course, Route 1.

The Federal Bureau of Public Roads has reported that roadside development helps prevent erosion and is a deterrent to "highway hypnosis", a dangerous and sometimes fatal boredom which occurs only on long stretches of superhighway. Accordingly, much emphasis has been placed on landscaping the new Con-

● CLOSE-UP view shows how chips are used at a typical bridge abutment planting. W. E. Gelson, of Country Gardens, and G. B. Griffin, landscape supervisor, are shown.

● **FOUR-INCH minimum cover of wood chips is used along western sections. Necessity for watering is reduced 60 to 70 percent, weed growth is 90 percent eliminated.**

necticut Turnpike, to make the route interesting as well as functional.

Of the $464,000,000 the Turnpike is expected to cost, a sizeable portion will go toward roadside development. The Turnpike Authority has contracted with A. Carl Stelling of New York City to act as landscape architect for the entire route. The Turnpike's 129 miles have been divided into 16 sections varying from 5 to 20 miles in length, with contracts for roadside development going to six nearby nurseries.

The most heavily traveled portions of the road will be the western sections between New Haven and the New York Line at Port Chester, New York, where direct connection will be made with the New England Thruway to New York City. Landscaping along these sections is in the most advanced stages. Contract value of roadside development along the 79 miles between Greenwich and the Connecticut River at Old Saybrook is $1,346,000. Another 50 miles of roadside remains to be developed.

E. T. Perkins, Chief of Planning and Traffic Design, and Hans Bauer, Landscape Engineer, both of the Connecticut State Highway Department, agreed with William Rutherford, Project Manager in charge of design and supervision for the Stelling firm, that landscaping must be done as completely yet as inexpensively as possible. Objectives included screening, sound mutation and safety. Country Gardens, Landscape Contractors of Huntington, Long Island, was awarded the contract to handle the two westermost sections of the Turnpike, which covered a 10-mile stretch.

The State authorities insisted that shrubbery and trees be hardy, long-lived, fast-growing and inexpensive to maintain. Country Gardens also was particularly interested in the expense angle. Nursery stock planted in the spring must be guaranteed for six months, and fall plantings for one year. Under this provision the nursery must water and weed all trees and shrubs and replace any which die or become unthrifty during the guarantee period.

Watering and weeding approximately 24,000 pieces of nursery stock along ten miles of highway can be a big undertaking, both to the nurseryman prior to the expiration of his guarantee, and to the Turnpike Authority afterward. State officials, the consultant and the contractor collaborated to find an easy solution to the twofold problem of weeding and watering the nursery stock. The answer was a mulch of wood chips designed to hold moisture and keep the beds free from weeds. They found that a lumber yard just off the Turnpike, had recently installed a Fitchburg wood chipper. Here was found a ready and adequate supply of slab wood waiting to be chipped up for cattle bedding, poultry litter and mulch.

Supply of Wood Chips

E. K. Wilcox of the lumber company agreed to supply wood chips to Country Gardens at the rate of $10 per cord, plus delivery expenses; 20,000 square yards of hardwood chips, a minimum of four inches thick, are being used along the two western sections of the Turnpike alone. Five cords of chips comprise a truckload which is dumped in the general area of the plantings. Chips are then hand-raked around individual shrubs, which are often on steep bridge abutments where machinery would be impractical. The usual rule has been three truckloads or fifteen cords of chips a day, delivered to various points along the Turnpike. Oak, birch, beech and maple, all hardwoods, are used to make the chips.

At nearly $3 an hour for labor it would be quite an expense if, in addition to planting shrubs and spreading chips, workmen were required frequently to water and weed the plantings. Fortunately they don't have to, because the chips take care of both maintenance jobs. They so retain moisture that watering is cut down 60 to 70 percent, and they eliminate 90 percent of the weeds, which are not able to push up through four inches of chips. As they decompose, furthermore, they supply an ideal mulch for the growing shrubbery.

Although on a bright fall day the chips may appear dry as tinder, they are actually fire retardant. The reason becomes apparent when a few chips on top are pushed aside, revealing the wet layers below, damp even after a prolonged dry spell. Moreover chips neither tend to blow away in a windstorm nor to wash downhill during a heavy rain.

Under the direction of Gerald B. Griffin of the Stelling firm, Country Gardens has selected nursery stock from all along the east coast in order to insure a planting of the highest quality. Trees and shrubs include oak, maple, linden, hawthorn, mountain laurel, dogwood, hemlock, four or five kinds of pine, honeysuckle and burning bush.

In addition to plantings at bridges and entrance-exit roads, individual evergreens are being used to screen buildings such as maintenance garages with their sand piles and road equipment, industrial plants and private homes. Furthermore it is planned to screen the adjacent railroad tracks to minimize distraction by passing trains. Vines will be used as a cover for barren rock formations where the highway was blasted through solid rock.

The nation's traffic fatality rate has been averaging well over 5 lives per 100,000,000 miles of travel. If the present trend continues on the Connecticut Turnpike its rate may go well below 2, to become one of the safest highways in the nation. The saving of human lives is being accomplished on this turnpike by a well planned roadside development program.

Safety Lighting Installed

AT GRADE SEPARATION AND INTERCHANGE

LANE H. MASHAW,
City Engineer,
Rockford, Illinois

● **BRILLIANT lighting of interchange in Rockford, Ill., has helped to solve a long-standing traffic congestion problem for motorists desiring to cross Rock River.**

THE INSTALLATION of 57 mercury vapor and 2 fluorescent luminaires on the grade separation and traffic interchange at North Second Street (US Rt 51) and Auburn Street, is the latest step toward solving a long experienced and much discussed traffic congestion problem in Rockford, Illinois. The presence of the Rock River flowing NE-SW through the City has naturally funneled large traffic volumes to the few bridges that span the river. At this particular location approximately one-third of the traffic approaching from the east, west, and south desires to turn left. The problem is further complicated by an even larger left turn desire at the peak hours 6 AM to 7 AM and 5 PM to 6 PM.

The first completed project to alleviate this bottleneck was the construction of a grade separation and traffic interchange, after years of planning and negotiations. This project was planned and supervised by the Illinois Division of Highways. During the construction period traffic was re-routed over City streets which created problems that at the time seemed to dwarf those that brought about the project. However, as is often the case, wounds heal rapidly in those instances when an improvement obviously results. The rapid increase in the traffic volumes using this intersection attest to its convenience. Traffic counts in 1941 indicated that 3800 cars daily crossed the Rock River at Auburn Street; today the count exceeds 23,000, an increase of 600 percent.

As so often happens, one good turn deserves another and the cry for adequate lighting went up before the concrete attained its ultimate strength. The need was even more obvious in view of modern lighting on the river bridge. Today, a fully lighted traffic facility is a reality, and we are busily engaged in planning a new bridge and traffic interchange to assist in moving a rapidly increasing demand from this highly industrialized city of 120,000. Added problems appear as a direct result of the increased traffic flow. Because of the heavy use of North Second Street, a large volume of turning traffic has developed at the first intersection east and west of the interchange, and also to the north at the junction of U.S. 51 and Illinois 173.

The contract for installation of the lighting was awarded to B & F Hi-Line Construction Corp., Rockford, for slightly over $33,000. The 59 luminaires are spaced approximately 150 feet apart, mounted 30 feet high, and provide a uniform, efficient, glare-free illumination. The luminaires and ballasts were furnished by Line Material Co. The smooth finished aluminum poles were made by Pfaff & Kendall, each having single or double 8-ft. arms. The circuits are controlled by a Sangamo Electric Clock and two South Bend Current Controllers mounted in a Crouse-Hinds Cabinet.

The initial average lighting level is in excess of 2-foot candles and the maintained average level is expected to be about 1½-foot candles. The use of constant wattage ballasts will improve the performance of the lamps during normal variations in supply voltage, and will help prevent extinguishing the lamps in the event of sharp, momentary voltage dips due to emergency conditions. An added advantage is a longer lamp life expectancy.

● **DAYLIGHT view of the intersection shown above, but looking North instead of Southwest. Traffic volume across the Rock River at this location is very heavy.**

SAMPLING INSPECTION METHODS

in Quantity Purchases of WATER METERS

DAN A. BROCK,
Analyst and Statistician,
Dallas City Water Works
Dallas, Texas

ANY LEVEL of inspection of items purchased can be rationalized; but often habit and custom, rather than reason, set up a level of inspection being used. Obviously, in matters of life and death, extreme certainty, and 100 percent inspection, is the rule; but where economic considerations are relevant, much less than 100 percent inspection can often be justified.

When the decision has been made that 100 percent inspection is not absolutely necessary, rational selection of the number of items to be inspected in a particular shipment remains. Consideration of mathematical probability enables us to sample on the basis of the average acceptance of percent defective we will tolerate, and we can know exactly the degree of the risks we take when we institute a particular plan.

We should consider and select a plan which is workable with the least supervision. Such a plan will and would reduce costs substantially, over and above the clerical and administrative costs themselves introduced by the sampling inspection plan.

Sampling inspection methods of current use in other industries are applicable in the circumstances of the Dallas City Water Works' receipt of $\frac{5}{8}$-in. water meter shipments. These methods were designed

Criteria for Setting Up Control on the Average Quality of Incoming Shipments of Basically Homogeneous Items **

Shipment Size	Control: Up to 1.0% Defective Allowed Average of Successive Shipments									Control: Up to 5.0% Defective Allowed Average of Successive Shipments								
	0.03 — 0.20% *					0.81 — 1.00% *					0.11 — 1.00% *					4.01 — 5.00% *				
(Number of Items)	First Trial		Second Trial		p_t	First Trial		Second Trial		p_t	First Trial		Second Trial		p_t	First Trial		Second Trial		p_t
	N_1	C_1	N_2	C_2	%	N_1	C_1	N_2	C_2	%	N_1	C_1	N_2	C_2	%	N_1	C_1	N_2	C_2	%
51-100	33	0	17	1	6.9	33	0	17	1	6.9	10	0	6	1	26.5	12	0	18	3	23.0
101-200	43	0	22	1	5.8	47	0	43	2	5.4	12	0	15	2	22.0	14	0	30	4	19.0
201-300	47	0	28	1	5.5	55	0	50	2	4.9	13	0	15	2	21.0	27	1	48	7	16.3
301-400	49	0	31	1	5.4	60	0	80	3	4.5	13	0	15	2	21.0	29	1	56	8	15.5
401-500	50	0	30	1	5.4	60	0	95	3	4.3	13	0	15	2	21.0	30	1	70	9	14.9
501-600	50	0	30	1	5.4	65	0	100	3	4.2	13	0	15	2	21.0	3	2	72	10	13.9
601-800	60	0	70	2	4.5	70	0	140	4	3.9	13	0	16	2	20.5	45	2	90	12	13.5
801-1,000	60	0	75	2	4.4	125	1	180	6	3.5	13	0	16	2	20.5	60	3	110	14	12.4
1,001-2,000	65	0	75	2	4.3	140	1	245	7	3.2	15	0	25	3	18.7	75	4	160	19	11.5
2,001-3,000	65	0	80	2	4.2	215	2	355	10	2.8	15	0	26	3	18.4	95	5	185	22	11.0
3,001-4,000	70	0	80	2	4.1	225	2	455	12	2.7	15	0	26	3	18.4	95	5	255	27	10.5
4,001-5,000	70	0	80	2	4.1	240	2	595	14	2.5	16	0	25	3	18.0	130	7	260	29	10.0
5,001-7,000	75	0	125	3	3.7	310	3	665	16	2.4	16	0	26	3	18.0	160	9	355	38	9.5
7,001-10,000	80	0	125	3	3.6	385	4	785	19	2.3	16	0	26	3	18.0	80	10	430	44	9.2

N_1 = size of first sample
N_2 = size of second sample
C_1 = number permissible defective in first trial sample
C_2 = number permissible defective, total of defectives in first and second trials
P_t = control percentage for the particular shipment being inspected; there would be less than a 10% risk of accepting as many as this p_t% defective in a particular shipment

* A Priori estimated average process created defective

** (1) Control at the 10% risk level; there would be less than a 10% chance that a long term run of shipments would be accepted possessing more than the stated percent of defective items
(2) Items should be from the same plant, process and specifications
(3) References: *Single Sampling and Double Sampling Inspection Tables*, Bell System Technical Journal, Vol. XX, 1941 (American Telephone and Telegraph Co., New York, N. Y.) and S. S. Wilks, *Mathematical Statistics* pp 222-5 (Princeton University Press, Princeton, New Jersey, 1950)

to achieve a maximum of control over the percent defective accepted, while at the time holding inspection costs to a minimum. Two features of these methods which tend to minimize the amount of inspection required are:

1) A sequential (in this case double) sampling plan is followed; and 2) *average* quality of a run of shipments is primarily brought under control, rather than the quality of any particular shipment.

Sampling inspection methods are especially useful and applicable where the items being received for inspection:

1) Are numerous, in the hundreds and thousands; 2) require a relatively expensive inspection process; and 3) are homogeneous, that is a) from the same manufacturer, b) from the same plant, c) built to the same specifications, d) of the same materials and e) in a relatively continuous process in time, without several months interruption in manufacture.

The proposed sequential sampling system calls for 100 percent inspection of a shipment whenever a predetermined number of defectives is found in a sample, or samples, from the particular shipment. Ideally then, we should like to have our inspection system running in such a way that variations in quality of shipments normally would occur in a random way, at a level consistently within the limits imposed by our sampling inspection system. In a system so operating, we could control the percent defective accepted by sampling only 5 to 10 percent of the meters received, seldom if ever needing to inspect a shipment 100 percent, except when a shipment was discovered actually unacceptable due to a high percent defective.

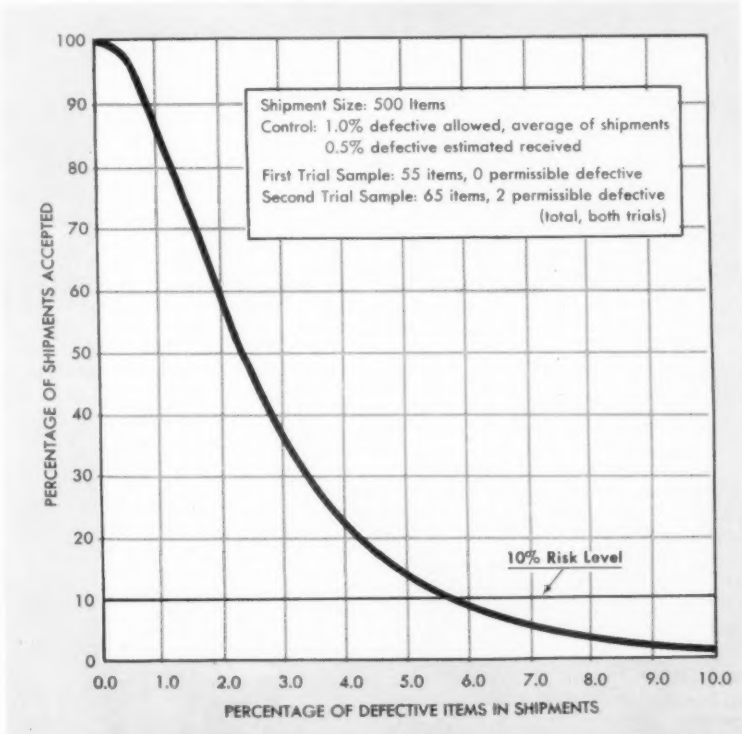
The table here reproduced is part of a more extensive set of tables developed by H. F. Dodge and H. G. Romig, first published in the Bell System Technical Journal (Vol XX, 1941, AT&T Co., New York, N.Y.). The tables give us choices as to the level of average acceptance of percent defective items, and within this limitation we choose the appropriate column of sample sizes in accordance with our estimate of the percent defectives being received over the long run. Mil-Std-105A referred to below also contains complete tables.

Adopting Inspection Plan

We have stated that the principal reason for adopting a sampling inspection plan is to achieve control of percent defective while holding

DOUBLE SAMPLING INSPECTION PROCEDURE
Inspect a First Sample of N_1 Pieces
If the Number of Defects Found in the First Sample
Exceeds C_1 But Does Not Exceed C_2
Does Not Exceed C_1
Inspect a Second Sample of N_2 Pieces
Exceeds C_2
If the Number of Defects Found in the First and Second Samples Combined
Does Not Exceed C_2
Exceeds C_2
Accept the Lot
Inspect All the Pieces in the Remainder of the Lot, and Remove All Defective Pieces

● **SEQUENTIAL sampling procedure provides for 100 percent inspection of a shipment whenever a predetermined number of defectives is found in a sample or samples.**



● **APPROXIMATE operating characteristic curve, based on double or sequential procedure, with conditions stated in box shown above; 10 percent risk level is shown.**

inspection costs to a minimum. In this light we shall look at the tables and consider our choice of control limits and estimated received defective criteria.

Sampling inspection plans create in themselves some clerical costs, and appreciable costs in executive time where, and if, administrative decisions are frequently called for. As previously discusssed, an ideal plan would operate more or less independently of top level supervision, top level intervention being needed only when a contracted or specified acceptable percent defective was being exceeded. It would obviously be futile to set up an inspection plan limiting average acceptance of percent defective to ½ of 1 percent when shipments in fact were generally 2 percent defective. Quite soon the acceptable defective (C_1 and C_2) levels would be exceeded, and we would again have 100 percent inspection, only now with the additional expense of the operation of the sampling inspection scheme.

In general then it is advisable to be conservative in setting up the plan: Conservative by setting average percent defective acceptable, and expected process created percent defective, levels a little higher than we would prefer, in the first instance, and expect in the second. Precedents exist, as in the U.S. Defense Department's MIL-STD-105A (11 Sept. 1950), for both loosening and tightening sampling inspection plans after they have been placed in operation.

The Dallas City Water Works, receiving ⅝-in. meters in shipments of from 300 to 1200, commenced a sampling inspection program setting control at the 1.0 percent defective allowed level (average of successive shipments), this control set up on the assumption that from 0.03-0.20 percent of the meters received are defective. Under this plan, if a shipment of 650 meters is received, 60 will be drawn at random for inspection. If none is found defective, the lot is accepted. If 1 or 2 are defective, another sample of 70 meters, is inspected. If the total defective in the first and second samples is 2 or less, the shipment is accepted. If the total allowable defective, 2 items, is exceeded in the first sample, in the second, or in both, 100 percent inspection of the shipment is commenced, and defectives are replaced with acceptable meters. A shipment or two from an unacceptably faulty process, say one creating 5 percent defective items, might be accepted on the basis of sampling inspection, but the odds are overwhelming that the fault would soon be detected, with attendant 100 percent inspection until the fault was remedied.

The tables also show columnar "p_t" or shipment protection values; these p_t values show the percent defective in a particular shipment which there is a 10 percent chance of accepting; these p_t values are high in some situations, as contrasted to the average percent control values at the top of the table. These p_t values are also a factor in our choice of a sampling plan, whenever we are interested in protecting ourselves from acceptance of high percents defective in particular shipments, as well as in the run of shipments.

When a sampling plan has been placed in operation and a particular shipment has been inspected and accepted in accord with an adopted scheme, then we can assume, at a 10 percent risk of being wrong, that the specified percent defective levels have not been exceeded. Now there is a greater than 10 percent risk that fewer than the control level percents are defective, and a less than 10 percent risk that more than the control percents are defective. Every sampling plan has its own "Operating Characteristic" curve; these curves are discussed in detail in **Sampling Inspection**, pp 17-24, 183-202 (Freeman, Friedman, Mosteller, Wallis: McGraw-Hill Book Company, Inc., New York, N.Y., 1948).

The Operating Characteristic curve is shown for double sampling, 1.0 percent defective allowed in average of run of shipments; shipment size 500 items, estimated received defective 0.5 percent. In passing, we note that our usage, "A Priori Estimated Process Created Defective" is the AQL or acceptable quality level in the Military Standard, and our "Control: Percent Defective Allowed, Average of Successive Shipments" is the AOQL or average outgoing quality limit in source material referred to.

Items are inspected by "attributes," they are either good or bad, with no in between or otherwise qualified classification. The criteria for acceptance of meters are generally specified in orders, bids, or contracts; but engineering may develop new criteria for acceptance, with some attention to economics.

A simple way to achieve a satisfactory random draw of meters for inspection is to draw from each shipment every meter with a serial number ending with the digit 7; this procedure furnishes 10 percent of the meters for inspection purposes. If more meters are needed, additional meters are taken from the shipment in any convenient order; if as many as 10 percent of the meters are not needed for inspection purposes, the balance not inspected may be returned to the shipment.

A form is used in the Dallas City Water Works meter shop to record and control meter inspections. The form is filled out for a 1.0 percent average defective control, estimating 0.03-0.20 percent received defective (from 3 to 20 out of 10,000), with a shipment size of 500 meters.

The supervisor of our meter shop maintains the continuity of the sampling plan; there is no "triplification" of paperwork in reporting results. The analyst, statistician, or engineer who sets up the plan can occasionally check on its performance.

STANDBY POWER FOR TOLL PLAZAS

MADE NECESSARY for safety and automation, stand-by electric power assures the smooth and continuous operation of the Dallas-Fort Worth Turnpike. Each of the 6 toll plazas on the Turnpike, operated by the Texas Turnpike Authority, is equipped with a Kohler 10 kw electric plant. The plants provide emergency power for floodlighting at toll plazas, emergency inside lights and operation of electric ticket machines. At one toll plaza, an electric plant provided emergency power for eighteen hours during a central power failure.

PROPERTY OWNERS WANT AN ADEQUATE LIGHTING SYSTEM

ADEQUATE street lighting for the city's business districts was high on the list of improvements planned for Traverse City, Mich., by City Manager, N. G. Damoose. The street lights in use were inadequate by modern standards and the years had taken their toll. Installed in 1928, the standards, made of cast iron, had been placed at the curb. Many bases were broken and the underground wiring was so badly deteriorated that operation required a combination of underground and overhead wiring. The overhead wiring was kept in place by wooden poles wired to standards. The appearance of the entire downtown area was unfavorable.

Mr. Damoose presented a program for new and adequate street lighting to the Chamber of Commerce. C of C members agreed that something must be done and that the City Manager's program was a good one. A street lighting committee was immediately formed and petitions circulated requesting improved lighting. Over 80 percent of the property owners signed petitions whereby the property owners were to pay 70 percent and the city the balance of the cost.

After much study of standard and luminaire types and pole placement, it was decided to use Kerrigan Weldforged 30-ft. octagon shaped standards, placed 3 feet back from the curb. Mercury vapor lighting was chosen and the OV-35, by Westinghouse, was the luminaire decided upon, using a 21,000-lumen lamp.

Final approval was received from the City Commission. Work started immediately and the City Light and Power Department line crew took over the job of installation. In a little over three months, work in the downtown area was completed and ceremonies were held to celebrate the "new look." The citizens of Traverse City were extravagant with their praise and felt it was the most forward step the city had taken in many years.

Today the downtown area is well lighted with 188 lights at a total cost of $55,000. Previously this area had 500,000 lumens in its entirety; today it is floodlighted with 3,948,000 lumens, giving Traverse City better business, more safety for pedestrians and motorists and greater protection against crime.

● **NEW LIGHTING** on the main business street of Traverse City, Michigan, was installed during a three-month period. Property owners paid 70 percent of the cost.

● **ONE AND A HALF** miles of new lights line Front Street from this point to the downtown business section seen in the picture above. Citizens approve the new look.

● **PREVIOUSLY** unlighted, S. Union Street now has lights. Standards 30 feet high, placed 3 feet back from the curbs, carry 21,000-lumen mercury vapor luminaires.

County

DEVELOPS COMPREHENSIVE REFUSE DISPOSAL PLAN

IN A STUDY of the problem and methods of disposal of refuse in Contra Costa County, Calif., it was assumed that the present population of 375,000 will, in the year 2000, be increased to approximately 1,400,000. The problem facing Contra Costa County is to provide and protect a sufficient number of adequate, efficient refuse disposal sites throughout the County to assure service for the present and future population.

In this study it was assumed that regardless of the method of refuse disposal employed: 1) Sufficient disposal sites can be provided within the County so that the haul distance will become a minor factor in the solution of the general problem; and 2) the right to operate a site implies a responsibility to conduct the operation in a manner which would provide realization of maximum capacity.

Present Refuse Disposal Operations

At present, Contra Costa County is being served by no fewer than sixteen different collection companies plus an unknown number of individual collectors. The companies have, in effect, developed their own service areas by negotiation among themselves. Each company or individual collector is free to negotiate its own collection rate with municipalities lying within its particular service area. Rates for unincorporated areas are set by the individual companies. All refuse is deposited at the following sites:

The Richmond site, privately owned and operated, is located on marsh and tidelands. Fill and cover operations are carried on at present but very little cover material is available at the site. When local sources are exhausted, the cover material will have to be imported unless dredging of bay mud proves practical. Three collection companies use the site and serve the communities of El Cerrito, Kensington, Richmond, San Pablo, El Sobrante, Pinole, Hercules and adjacent areas. The life expectancy of the site is estimated to be nineteen years. It is possible for this site to be expanded.

The Acme Fill site is privately owned and operated. Fill and cover operations are carried on using cover material at the site. The estimated life of the site is thirty-three years and when available cover material is fully used it will be costly to import more. Ten disposal companies using this site serve twenty communities in the surrounding areas.

The Pittsburg site, privately owned and leased to the operator, serves the City and the surrounding area, and is used by only one collection agency. It is operated as a land fill and the estimated life of the site is about sixteen years. This site has possibilities for expansion.

The Antioch site is privately owned but is leased by the City of Antioch which contracts for its operation. It serves the area in and around the City of Antioch, and is used by one company. Open dumping with burning is the method of disposal. This site is practically filled to capacity and there is a possibility for expansion.

The Brentwood site, owned by the County, is leased to the City of Brentwood which contracts for its operation. One collection company uses the site and operates it with open dumping and burning. It is almost filled to capacity and it is unlikely this site will be expanded; the operations will probably be transferred elsewhere.

The Byron site, owned by the County, is used only by individuals and not by collection companies. Open dumping is the method of disposal and the dump receives routine policing by County personnel. There is very little capacity remaining and the operations at this site could well be transferred to another area.

The Cowell site, owned and operated by the Cowell Cement Company, serves only the community of Cowell, and is a landfill operation.

Refuse now originating in the community of Crockett is being hauled to Benicia. A new site in the immediate vicinity of Crockett has been established. This site will be privately owned, administered by the Crockett-Valona Sanitary District, and is intended to serve the community of Crockett. It is expected to be operated as a canyon-type land fill operation. Negotiations relating to operations of the site are still in process.

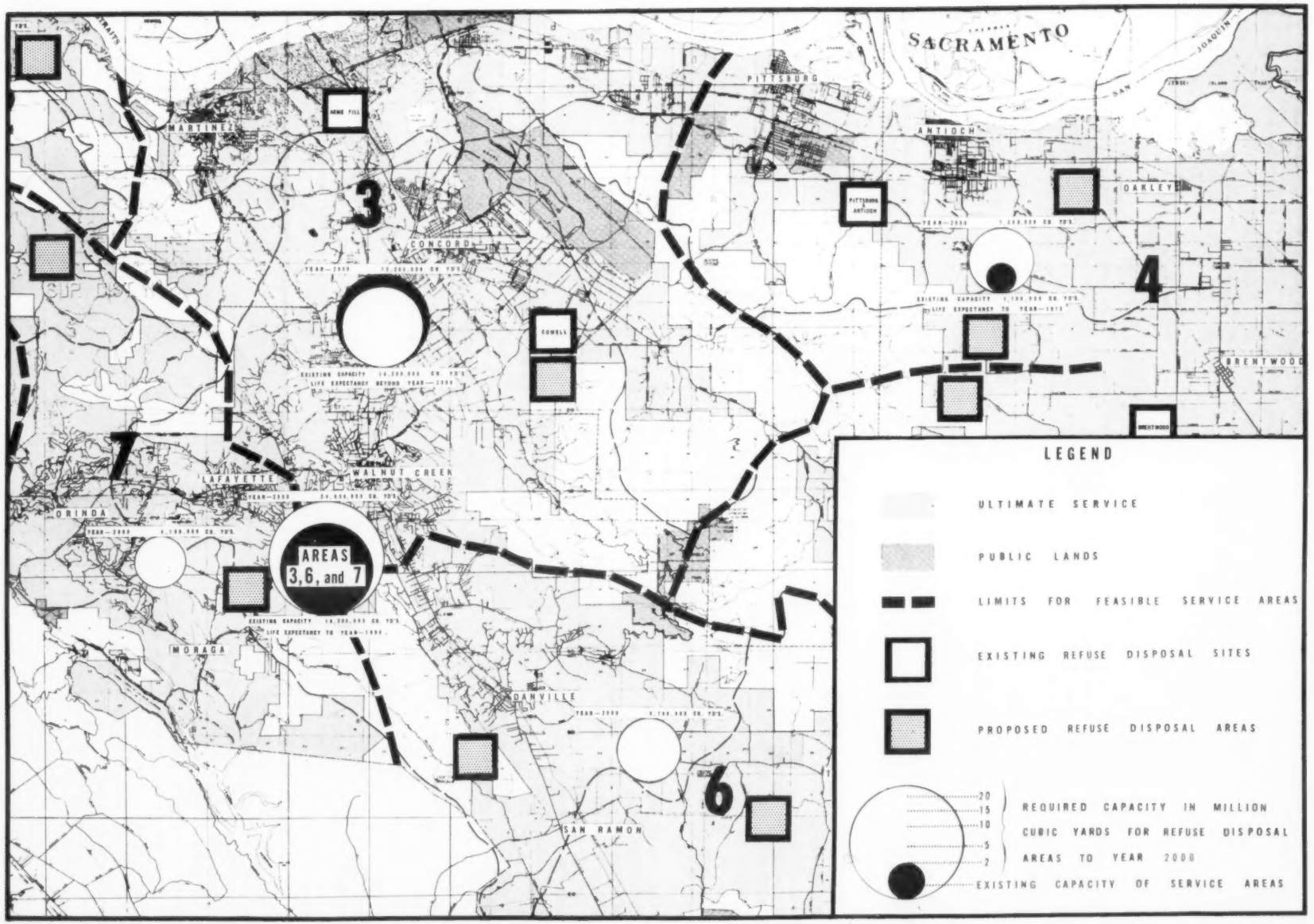
The Federal Government installation at Port Chicago uses a silo-type burner and landfill method of disposal of refuse. Camp Stoneman uses the landfill method of disposal except for some open burning of rubbish. However, these installations do not come under the jurisdiction of local agencies.

In general, the situation in Contra Costa County may be simply stated by saying that existing disposal sites are too few and their total capacity is too small to meet the needs to the year 2000. It is not unreasonable to assume that if sites are difficult to locate at present, the situation will be next to impossible in the future.

Legal Aspects

Under existing legislation, the County, its various cities, sanitary districts and sanitation districts have the authority generally to regulate collection and disposal of refuse within their respective jurisdictions. In some cases this authority extends to the franchising of collection and disposal companies

● **MAP of a portion of Contra Costa County shows feasible refuse disposal areas and has a pictorial representation of capacity studies.** ➡


SACRAMENTO
PITTSBURG
ANTIOCH
MARTINEZ
CONCORD
OAKLEY
BRENTWOOD
COWELL
WALNUT CREEK
LAFAYETTE
ORINDA
MORAGA
DANVILLE
SAN RAMON
3
4
1
6
AREAS 3, 6, and 7
LEGEND
ULTIMATE SERVICE
PUBLIC LANDS
LIMITS FOR FEASIBLE SERVICE AREAS
EXISTING REFUSE DISPOSAL SITES
PROPOSED REFUSE DISPOSAL AREAS
20
15
10
5
2
REQUIRED CAPACITY IN MILLION CUBIC YARDS FOR REFUSE DISPOSAL AREAS TO YEAR 2000
EXISTING CAPACITY OF SERVICE AREAS

and the issuance of permits. Possible conflicts among the various jurisdictions within the County undoubtedly can be resolved as they arise.

The projection of future County-wide needs for refuse disposal sites was carried to the end of the present century. The projection of this need is based upon the following considerations: 1) Existing site capacities; 2) anticipated population growth; 3) amounts and character of refuse; 4) landfill method of operation.

Disregarding other salient factors, the basic assumption made by the Staff in predicting population growth was: Topography offers the most logical index to the inherent ability of land to develop for residential use.

A situation quite common to lands suitable for residential use throughout the County is the lack of an established trend toward a particular density of residential development. The anticipated population on these lands was predicted by assuming that, on the average, every two families in Contra Costa County consisted of seven individuals. Housing density for each slope class was then assigned as shown in Table 1.

The basic information pertinent to the development of the population projects was represented on a total of twenty-two slope study sheets. These sheets are reproductions of U. S. Geological Survey Quadrangle Sheets to a scale of 1-in. = 1,000 feet. By using the contour lines shown on these sheets it was possible to delineate lands within the four slope classes mentioned above. In addition, boundaries of incorporated municipalities, governmentally owned lands, unincorporated lands zoned industrially, and existing and proposed County and State roads were also shown.

The fact that the average collection company does not maintain detailed records makes it difficult to determine quantities of refuse collected for estimating purposes. In addition, most companies collecting domestic garbage and refuse also collect commercial refuse. Little information is available concerning these commercial quantities and they are usually included with residential figures.

The factor necessary for estimating refusal disposal site capacity for landfill operation is the site volume used annually per capita and the volume of earth cover required to operate the site in a sanitary manner. Since methods of operation of

Table I—Housing Density by Land Slope

Ground Slope Class	Homes Gross/ Acre	Population Gross/ Acre
0 to 5 percent	4	14.0
6 to 15 percent	3	10.5
16 to 25 percent	2	7.0
26 percent plus	1/7	0.5

future refuse disposal sites will vary with topography, amount of cover material, presence of ground water and other factors, it was assumed in the interest of conservatism, that 25 percent of the site volume used per capita would be cover material.

The Staff had no estimating figures available other than those published in current reports on refuse disposal. A study of these publications and other data was the basis for the following assumptions: Estimated refuse: 2.16 pounds per capita per calendar day; weight of compacted refuse in place: 800 pounds per cubic yard.

Policy Matters

In the unincorporated areas of the County and some of the cities the various refuse collectors have established collection routes, frequencies of collection, and rates for collection. These arrangements are not regulated by County ordinances. In most cities in the County these matters are regulated under franchise type contracts. This lack of regulation by the County has been recognized by the Board of Supervisors in its reactivation of the Citizens Waste Disposal Committee on October 31, 1957 for the purpose of studying the matter of County franchises for garbage collection. The need for this study is well exemplified in the central area of the County where rates in the unincorporated areas recently were increased from $1 per month to $1.50 per month. This $6 per year increase is equivalent to about 15 cents on the tax rate for a home with an assessed valuation of $4,000. At the same time, service within the City of Walnut Creek, under a franchise with the same collector, is still provided at the $1 month rate. Franchising was considered by the Citizens Waste Disposal Committee in its 1954 report and its conclusion follows:

"The entire Committee agreed that the collection and disposal of garbage or waste should be on a franchise basis." Public operation versus private operation of disposal sites has been a controversial issue. Some believe that the refuse disposal operations should be considered to be of sufficient general concern as to be controlled as a public utility with sites owned and operated by a public agency. Others maintain it is a proper private business which is more efficiently conducted as such.

This information appeared in the Report and General Plan for Refuse Disposal in Contra Costa County, California. The Director of Public Works is Victor W. Sauer and Thomas G. Heaton is Director of Planning.

Rotary Plow Clears Colorado Snowslide

LAST Spring the Colorado State Highway department put its new Snowblast full-rotary snowplow to work on snowslides that had covered U.S. Route 550 north of Silverton, and reports that the experience with the machine was very satisfactory during the short time it was used. The Snowblast is made by Edward F. Taylor Co. of Denver.

● **EROSION** of roadway slopes in cut sections and on embankments is major maintenance problem in Ocean County.

● **SLOPE** erosion, a primary cause of unsightly roads, can be materially reduced by flattening side slopes and seeding.

SOIL EROSION PROBLEMS IN A COASTAL COUNTY

Sandy soil is easy prey for erosion when natural sod is disturbed, and constant work is needed to prevent damage to county roads and bridges

LAWRENCE F. WAGNER,
Ocean County Engineer,
Toms River, N. J.

THERE ARE 620 miles of roads in the Ocean County Road System connecting State Highways, towns and hamlets. The county is in the Atlantic Coastal Plain and the slope of the ground adjoining these roads and the grade of the roads are generally flat and rolling. The character of the soil is sandy interspersed with areas of clay and gravel. The rainfall is between 40 and 50 inches per year. The slope of the ground and the character of the soil are such that a large percentage of the rainfall percolates quickly through the soil. Nevertheless after the soil becomes saturated there is still a large percentage of the rainfall that must run off as surface water, and where there is run-off there is erosion. The sandy soil is chemically stable in water, but its character is such that the soil is easy prey for mechanical erosion, and if uncontrolled will do a considerable amount of damage to roads and their appurtenances in a short time.

The majority of the County Roads are constructed with a gravel base covered with a mixed-in-place bituminous surface. This surface keeps the right amount of moisture in the gravel base of the road and prevents erosion due to rains and the wear and tear of traffic. Through the use of proper equipment and the training of road men in the handling of equipment and materials a smooth surface is obtained. By keeping the roads in a smooth condition heavy fast-moving traffic loads do not break the road surface through the impact which would occur if the roads were not smooth and firm. Today an 8-in. thick gravel pavement is constructed by contract for $0.30 per psy. The top 2 ins. is then treated with bituminous material and mixed-in-place for an additional $0.35 psy.

In some towns and in some rural sections more permanent roadway pavements have been constructed of concrete and bituminous concrete to meet the demands of traffic, but the amount of funds available has limited this highly desirable type of construction.

Erosion of Highway Shoulders

Most of the roads are constructed with a paved width of 30 feet. This provides space for 2 10-ft. lanes for traffic with 5-ft. shoulders. The shoulders and the traffic lanes are all covered with a mixed-in-place bituminous surface making one uniform surface from side to side. This eliminates erosion of the shoulders which would occur if not paved. Where traffic warrants, paved widths of 40 to 44 feet are being used.

Erosion of roadway slopes in cut sections and on embankments is another potential problem. If left uncontrolled, the soil forming the slopes either washes down the shoulders of the roadway or into adjacent fields and ditches. It is the type of erosion which is one of the primary causes for unsightly roads in this day of paved roadway surfaces.

The slope erosion problem can be materially reduced by flattening the slopes and seeding. Slopes of 3 to 1 and 5 to 1 are common. At many locations obsolete guard rails at the top of steep slopes in fills have been eliminated at a saving by constructing flatter slopes. The natural soil on slopes is fertilized, seeded, and mulched at a cost of $0.12 to $0.15 psy. Peat humus is added to the soil when necessary at a cost of $0.15 psy. On new roads the slopes in cut sections are entirely seeded. On slopes in fills the top 5 feet is seeded and in a few years the entire slope becomes seeded because the seeds soon spread dowward.

In cut sections on both new and old roads where considerable ero-

sion and sliding occur on high slopes, underdrains are constructed to intercept the ground water which is a real contributary cause to soil erosion. Construction of such underdrains is costly but it prevents surface erosion and keeps the underground water in a safe channel. In rural areas due to the lack of funds, ditches parallel with the roadway are constructed properly to drain the slopes and roadways. On some long steep grades storm sewers have been constructed to intercept surface water before it has the opportunity to do erosion damage.

On nearly all roads the natural run-offs between cut sections and embankments create erosion problems. Turfing or sodding these areas has proved satisfactory in preventing washouts. Bituminous treated gutters have been constructed to lead the water from the road. It is an established fact that some sort of resistant material must be used to prevent erosion at these places.

Erosion In Roadside Ditches

The construction of new ditches and the maintenance and regrading of existing ditches in the light sandy soil encountered in Ocean County is usually a continuous headache, since erosion will start practically as soon as the natural sod is disturbed and the sandy soil exposed to the action of the water. To cope with the erosion of ditches it is best to keep the slope of the ditch as flat as possible and get grass to grow on the slopes as quick as possible. On ditches with steeper slopes it is necessary to protect the flow line with rubble masonry, concrete, or bituminous surface material.

● **PAVING shoulders with bituminous surfacing reduces erosion, but in some cases the ditch must be paved as well.**

Nearly all roads have bridges and culverts through which streams run. Extreme care must be exercised in the design and construction of such structures. The State Water Policy Commission has jurisdiction over this work and they have made excellent strides in solving various problems that have come before them. Their efforts are clearly seen in many existing structures and in new structures designed and constructed today.

Bridges and culverts must be designed not only for size and capacity but for stability. By stability I mean that the slopes and bulkheads of the structures and the stream channels should be so constructed and protected as to prevent erosion in times of high water. This can be accomplished by turfing or constructing masonry to the toe of slopes adjacent to structures. Four inch thick concrete blocks can be laid with cement mortar joints at a cost of $5 psy.

In the county along many of the streams and adjacent to county highways are many acres of cranberry bogs and small lakes. These bogs and lakes have been created by the construction of dams, usually earth dams. These dams indirectly create a dangerous erosion problem on county roads. In times of floods the bog owners have their own erosion problems and if the earthen dams are not properly constructed, they give way and down stream comes the water that they have held back. This overtaxes the openings in bridges, resulting in damage to drainage structures. In Ocean County, by gentlemen's agreements, arrangements are usually made with bog owners whereby the County Engineer co-operates in designing and supervising the construction of new dams and spillways which are in close proximity to county highways. This method has protected many bridges to a higher degree of stability.

Fixing Sand Dunes

Many miles of county roads extend along the sandy shore of the Atlantic Ocean and due to the sandy soil, the roads are subject to wind erosion. The sand from the beaches is piled up by the driving action of the wind into mounds and ridges. These dunes build up and move; especially during the winter months when the prevailing winds are strongest, they encroach upon roadways and adjoining property. In a few months' time the sand if not removed would reach a depth of a foot or more. Annually many cubic yards of sand must be cleaned up from these roads and carted away.

(*Continued on page* 150)

● **THIS happened when a subdivision developer removed the ground cover, permitting storms to cover the road with sand.**

● **SEEDING a strip five feet wide on embankments results in a complete cover within a few years, protecting the slope.**

SEWAGE PUMPING STATION INVOLVES UNUSUAL PILING WORK

EARL PATTON,
City Engineer
Owensboro, Kentucky

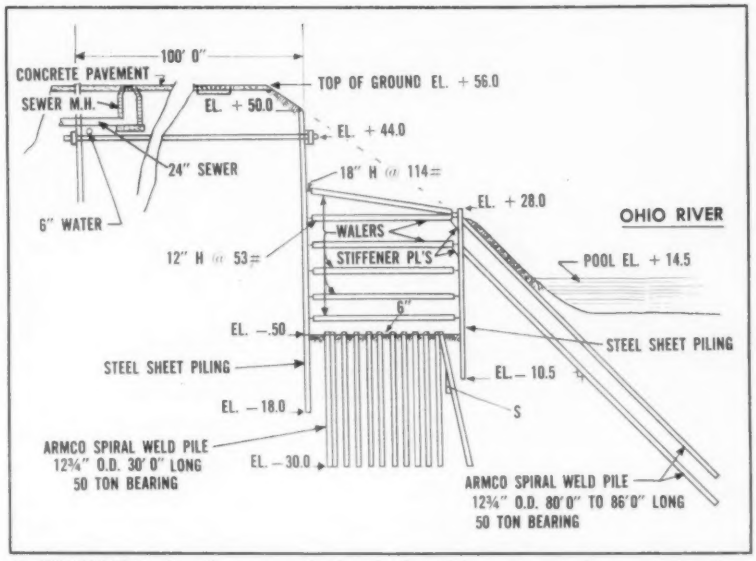
BECAUSE OF expanding industry and residential growth it became necessary for Owensboro to revamp its sewerage system. Before approval for this could be obtained from the State Board of Health it was necessary to include in the program three pump lift stations and a sewage treatment plant. Previously, storm and sanitary sewage was discharged into the Ohio River without treatment. Since the city wished to qualify for federal aid under the 1956 Pollution Control Act, it went ahead with the preparation of plans for a treatment plant.

The program, which will cost $2.8 million, includes the installation of about 20,000 feet of new interceptor sewers, three new lift stations, lining existing sewers and a primary treatment plant.

Of the three lift stations, the one located at the foot of Center Street presented severe construction problems which were ultimately solved by the piling contractor, Harry O. Wyse of Lexington, Kentucky.

To begin with a cofferdam was required. The thing that sets this particular structure apart from others is its location midway on a steep bank of the Ohio River. Center Street, some 42 feet above pool stage of the Ohio River, is a paved street with buildings on both sides, but ending at the river bank. The cofferdam is about 41 by 52 feet. The sewer pump lift station was built inside the cofferdam on a subgrade approximately 20 feet below pool stage water level. The bottom 25 feet of soil is quicksand.

Building a cofferdam in the middle of a 1 to 1 slope is quite a problem. There was a heavy load on the land side and nothing to brace against on the river side. For the first operation the contractor drove a line of sheet piling parallel to the top of the bank. Then the remaining three sides of the cofferdam were completed. To brace the entire structure, a double row (one 6 feet above the other) of 12¾-inch diameter Armco pipe piles were driven on a 45° batter into the river bottom to depths from 80 to 86 feet. These piles, designed for a bearing of 50 tons, were driven from the top of the river bank through holes cut in the river side sheeting. They were cut off at the top and welded to the river side sheeting and to a large structural steel waler.



● **PUMPING station for sewage had to be located on steep and narrow site along river. Diagram shows how piling was used to ensure stabilization of the structure.**

These battered piles braced the river side of the cofferdam, and by a system of struts also braced the land side. However, it was felt that additional support was needed to hold the high surcharge on the land side. After considering other possibilities, it was decided to drive five 100-foot long structural members horizontally (at a slight grade) into the bank. One crane located on a barge held the weight of the hammer and leads while another crane located on the bank maintained a constant pressure of the hammer against the end of the pile. In addition, two 12-foot long piles were driven vertically for an anchor on each side of the tie-back structural member.

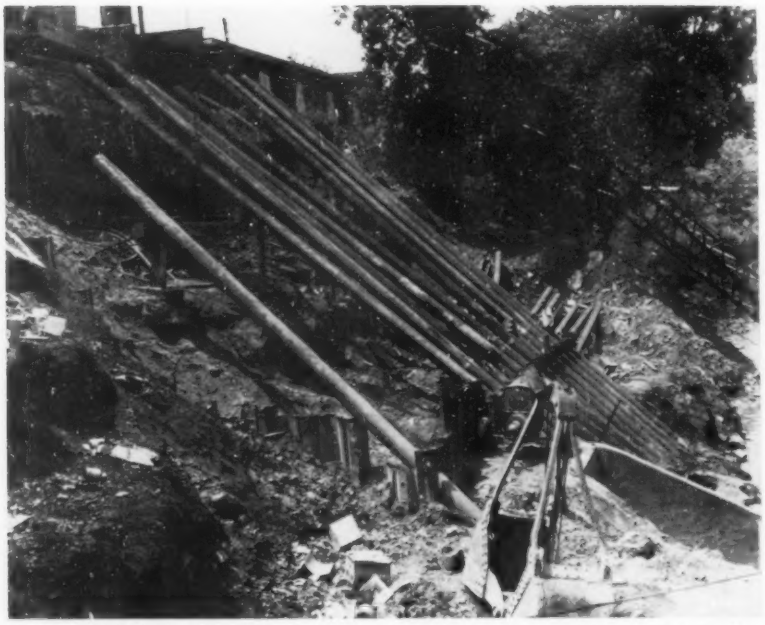
The danger of movement during construction was great; however, the operation proceeded without mishap. The cofferdam also withstood the vibrations from the foundation pile driving operations. To support the pump station structure, 52 pipe piles, 12¾-inch OD, 0.188 wall thickness, were driven approximately 30 feet below floor grade, which was 15 feet below water level. Driving was done with a McKiernan Terry 9B3 hammer. It took an average of 15 blows per inch to drive the piles to 50 tons capacity.

The other two pump stations also required foundation piling. The Locust Street station has 58 pipe piles and the Dublin Lane site has 56.

The Treatment Plant

A large part of the $2.8 million cost is the primary treatment plant. It consists of the operation building, settling basins, sludge digesters and drying beds. The effluent is discharged into the river downstream from the city. The plant is designed to handle an average sewage flow of 7.5 mgd, based on an average of 100 gallons per day per capita for the present population of 50,000, plus allowance for growth. Maximum flow design capacity is 30 mgd.

Foundation problems of the plant structures were solved by using subdrainage pipe to carry away unwanted ground water. Approximately 1800 feet of 6-inch diameter Armco Hel-Cor perforated pipe was installed under the settling tanks, digester and main building. Two 42



● **TO SUPPORT** the structure on the river side it was necessary to drive piling 80 to 86 feet long and on a 45 degree angle. These were designed for 50-ton bearing.

● **BATTERED** piles were cut off at top and welded to the river side piles.

by 42-inch Armco gates, Model 35-05 with CPE-4 lifts were used to control the flow out of the settling basins. Also a small 8-inch diameter gate was used for controlling cross flow in this stage of treatment. To control the flow of incoming sewage into the basin, a battery of gates, Model 5-00, was used. By spacing these gates across the lead wall, it was possible to distribute evenly the flow across the width of the basins.

Design engineers for the pump station, new interceptor sewers and the treatment plant are Consoer, Townsend and Associates of Chicago, Illinois. Resident or associate engineers supervising construction are Johnson, Depp and Quisenberry, Inc. of Owensboro. Clark Construction Company, also of Owensboro, have the general contract for the three pump stations. Walter Verser was the superintendent for the piling contractor. The treatment plant is being built by Markwell and Hartz of Memphis, Tennessee: Harry Brewer, Superintendent. The entire program is under the planning and supervision of the city engineer's office.

STEAM INJECTION OPENS GREASE-CLOGGED SLUDGE LINES

E. E. ROSS, Superintendent, and

GLENN H. DAVIS, Sewage Works Supervisor,

Special District No. 1, East Bay Municipal Utility District, Oakland, California

PROVIDING continuity of service is the essence of any municipal sewage disposal operation. For Special District No. 1 of the East Bay Municipal Utility District, this means serving the requirements of Oakland, Berkeley, Emeryville, Albany, Alameda and Piedmont, California. A publicly-owned, non-profit community undertaking, the system was built in the late 40's at a cost of nearly $23 million to serve these communities.

The treatment plant is designed to give primary treatment to an average dry-weather flow of 128 million gallons daily, and to handle a maximum rate of flow of 291 million gallons daily. Facilities are provided for prechlorination, screening, grit removal, primary sedimentation and separate sludge digestion. The digested sludge solids from the digestion system and the effluent from the plant are discharged into the deep waters of San Francisco Bay through an outfall sewer approximately three miles long.

During certain months of the year, particularly from mid-November to mid-March, cold-weather ground temperatures act to congeal the grease in the raw sludge and to cause it to deposit in the raw sludge force main. The resulting constriction can—and did on occasion during the first year of operation—reach the point where raw sludge pumping was completely halted.

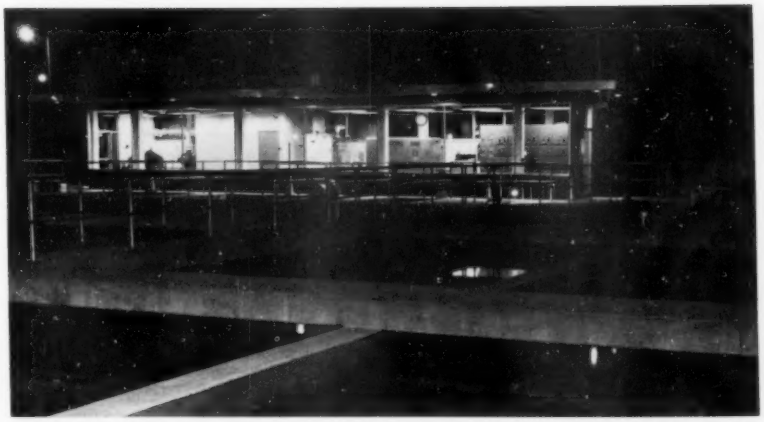
The first time this happened a commercial sewer-cleaning service equipped with power-driven sewer-rodding equipment, was employed to clean the line, at several hundred dollars cost, plus downtime expense of other men and machines.

Taking over the periodic clean-out function was still expensive and laborious. It was found that it took 3 men nearly 8 hours to clean the pipeline. This was necessary as often as every 10 days during the crucial period to maintain the line's capacity. A more economical solution to the problem was needed, because, in addition to our resulting overtime and total hourly cost factors, men had to be taken from primary responsibilities to clean the line, which further increased the cost.

Among the considerations, and one which from a cost standpoint alone had much to recommend it, was the idea of introducing steam directly into the flow in the force main. The resulting increase in temperature would prevent build-up by keeping the fats and grease fluid and easy to pump.

Steam Generator Meets Need

The flexibility and small floor space requirements of a complete or "package" steam source with minimum warm-up and supervision needs were attractive. One of several such units investigated was a forced recirculation unit produced by Clayton Mfg. Co. One of their units was observed in operation at a large railroad yard in the area. The particular application in this instance was "in-station" heating of cars while on standby. Although a different use, it was possible to check the unit's performance, safety features, output, and maintenance record.



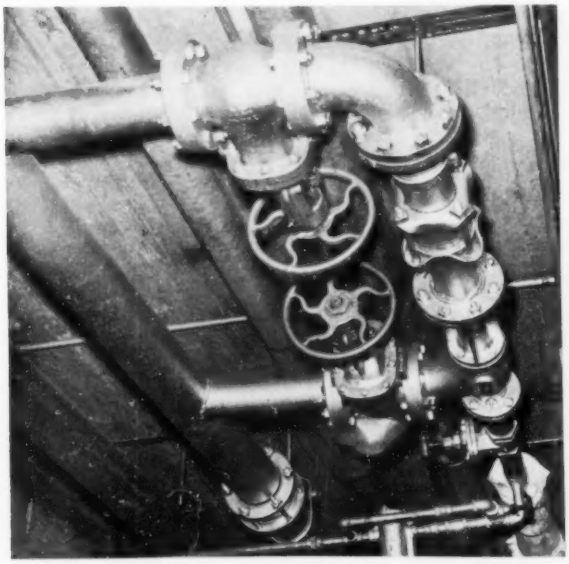
● **EAST BAY District sewage treatment plant, capacity 128 MGD, had problems due to stoppage of sludge force lines from deposition of grease during cold weather.**

After further investigation, a 100-hp Clayton unit was purchased and installed prior to the winter season of 1954-55. Since that time, sludge force main cleaning has been greatly simplified. Operation of the steam generator for 2 to 3 hours per day during the period of cold weather is usually sufficient to maintain satisfactory pumping conditions.

The Clayton unit has been operated entirely on sewage sludge gas produced as a by-product of the sludge digestion process. Although this is a wet, low BTU fuel (approximately 50 percent that of natural gas), there have never been any firing problems.

Construction is now under way on a duplicate raw sludge main from the sedimentation basins to the digesters. This will double our raw sludge pumping capacity and increase plant flexibility in line with increasing community needs. The steam generator will be used to clean either one or both mains as required.

A separate grease line is also being constructed which will divert a portion of our daily pumping load to a special grease collection and disposal unit. Here the generator will be employed to serve both steam-jet-pump and heating functions. With this increased facility, we estimate our daily use of the steam generator will be extended to all three shifts.



● **VENTURI-type pipe heater prevents grease build-up in sludge lines by direct steam injection from package plant.**

● **STEAM generator unit shown above provides automatic operation, with entire safety, compactness and cleanliness.**

FLORIDA CITIES

TURN TO SURFACE WATER

C. E. WRIGHT

TWO FLORIDA east coast cities, Melbourne and Lake Worth, are substituting surface water for well water either in whole or in part. The significance is that, though Florida has more surface water within its boundaries than any other state, about 93 percent of its water supply is obtained from wells. In addition to more than 30,000 fresh water lakes, the state has 12 river basins of large area and 17 of the 75 first magnitude springs in the United States. But with all of this surface water, underground water supplies are even larger, forming an apparently inexhaustible supply. With growing population, however, the drawdown on some wells, particularly those close to salt water, has raised problems of salt water infiltration, necessitating removal of wells to points farther inland. Miami has gone back about 10 miles, the city of Cocoa reached 30 miles for a new well field and the Pinellas beaches have gone back about 15 miles from the Gulf of Mexico.

Melbourne, which had less than 5,000 people in its corporate limits in 1950, now has a population of about 20,000 to serve, including burgeoning suburbs of Melbourne Beach and Indialantic and many subdivision developments. A field of 11 wells at the airport, now serving the community, will be discontinued by March, 1959, by which time the Melbourne area will be getting its water from Lake Washington, 10 miles to the west. A bond issue of $6,750,000 was sold to pay for this improvement, which includes new distribution lines to beach areas and a treatment plant on the shore of the lake designed to handle 6,000,000 gpd. Contract for this plant has been awarded.

Melbourne's well field is situated over an old salt bed, with an ever-present danger of salt water intrusion. The best that the wells are able to do is 80 to 100 gpm whereas in Fort Lauderdale, 147 miles farther south, wells produce 2,000 to 2,200 gpm. In this situation Melbourne sought an everlasting supply, which could most readily be obtained from Lake Washington, which is part of the St. Johns River system. This was recommended by Alfred Lefeber Associates of Cincinnati, engineers for the project, as the quality of the well water was becoming increasingly unsatisfactory and even a new well field would not have helped materially.

Analysis of the well water shows the following: (all concentrations are in mg/L except the pH) Calcium carbonate, 336; carbonate hardness, 296; non-carbonate hardness, 40; pH, 7; iron, 0.6; calcium, 128; magnesium, 4; sodium and potassium, 27; and chlorides, 70.

The lake water, untreated, analyzes as follows: (all concentrations are in mg/L except the pH) Calcium, 9.6; magnesium, 1.7; sodium and potassium, 13.0; iron, 0.1; silica, 4.6; sulphates, 3.2; total hardness, 42; carbonate hardness, 31; non-carbonate hardness, 11; pH, 7; chlorides, 20 to 40; and color 45 to 100.

Distribution mains to the beach areas, extending to the southern limits of Patrick Air Force Base, which lies between Melbourne Beach and Cocoa Beach, constituted the initial part of the construction program and will take almost half of the total cost, or $3,009,000. The treatment plant cost was estimated at $807,000, storage tanks at $340,000, intake station and pumps at $191,500 and booster station and reservoir at $98,000.

Treatment Plant Design

The treatment plant of flexible design is geared to an estimated population of 31,750 in the service area by 1960, with further provision for 46,150 by 1970 and 58,850 by 1980. It was determined that no well field that could be found in the vicinity of Melbourne would supply the volume and quality of water needed for this potential growth, and it was also determined that a mixture of surface water with well water would not be satisfactory owing to the chlorides in the well water and the sulfate odors. As to volume, the wells, which supplied an average of 365,930 gpd in 1948, had been furnishing 644,500 gpd in 1955, at which time the decision was reached that a new source of water supply would have to be found. The design capacity of the treatment plant is 4 mgpd by 1960, 6 mgpd by 1970 and 8 mgpd by 1980.

Although the lake water is soft with low chlorides and color content, it will be given full treatment along conventional lines and at a much lower treatment cost than would have been possible with the well water even had the latter been present in sufficient volume. Moreover, there is no question as to the volume to be available from Lake Washington, which is fairly large and estimated to be capable of supplying 135 mgpd, which will be more than ample for any future need that can be envisaged.

The treatment plant is being built on what was low land on the lake shore. This was raised to a height of 1½ ft. above the highest lake mark by fill from a lagoon, 160 ft. wide and 1750 ft. long, which was dredged to a depth of 16 ft. The plant design is set up for Dorr (or equal) equipment, and includes a filter, coagulation basin and chemical treatment facilities to add lime, alum and carbon. From the treatment plant the water will be pumped through existing mains to residents of the city proper, but the water for beach areas will pass through new 20-in. mains. Crossing the Indian River (the Intracoastal Waterway) the main is subaqueous along the causeway, with Molox joints used in the river crossing.

Water users outside Melbourne corporate limits will pay rates 25 percent higher than those charged city users. All water revenues to be derived from the new system constitute the backing for the revenue bonds.

Lake Worth's Problem

Lake Worth's water problem differed somewhat from that of Melbourne. Its well water is compatible in quality with the surface water to be used, but present and future volume is not sufficient for the community's growing resident popula-

tion now about 18,000, which in winter is increased by many thousands of tourists. The present water system was built in the 1920s, when population was much smaller. The 12 wells have a safe yield of 12 mgpd and are subject to lateral intrusion if over-pumped. It was determined that no greater quantity could be obtained even with additional wells as they would all be drawing from the same field. Although peak demand has not risen materially higher than 8 mgpd, the steady growth of the community hastened plans for a supplementary supply, for which Lake Osborne, lying along the westerly limits of the city, is being tapped. This lake is fed by canals from Lake Okeechobee, the second largest fresh water lake lying wholly within the limits of the United States, which with the conservation work being carried out in the Central and Southern Florida Flood Control Project will provide an ample and constant supply even during periods of light or no rainfall.

On the basis of a projected population gain to about 34,000 by 1976, the engineers for the city, Russell & Axon of Daytona Beach, Fla. recommended a treatment capacity for lake water of 12 mgpd, but with plans drawn for expansion to 16 mgpd at a later date. This recommendation followed a study of water consumption per capita in the area over a period of many years. The per capita average in 1956 was 200 gpd based on resident population but taking into account the population increase during at least three winter months.

The compatibility of the well water and surface water in the Lake Worth area is shown by the comparison in Table 1.

Table 1—Comparison of Well Water and Surface Water in Lake Worth Area

	Wells	*Lake Osborne*
Color mg/L	25-75	57
Total Hardness mg/L	176-232	127
Chlorides mg/L	27-51	26
Iron mg/L	0.3-0.5	0.2
Total Alk. mg/L	164	109
pH	7.4-7.7	7.9

To finance its supplementary water system, Lake Worth sold $1,600,000 of water treatment bonds, to which will be added $700,000 from general funds for distribution lines and a 500,000-gal. storage tank.

The treatment plant is to be situated about 1,000 ft. each of Lake Osborne. The lake has a maximum depth of about 10 ft. The water will be pumped under automatic controls operating off a clear well level. The well field is situated about 1,500 ft. from the treatment plant. The wells will be operated in three banks of four each, so arranged that each bank can be cut in as needed. When requirements get beyond the safe yield from the wells, surface water will be used. Thus, while the lake water will be supplemental at first, the engineers have provided for the possibility that ultimately the water supply for the area will be surface water, and for that matter also for much of Florida's lower east coast.

Treatment is designed for turbidity removal, color removal, softening and iron reduction. Water from the two sources will be blended by a propeller type flash mixer. Then conventional chemical additives will be applied—lime for softening, activated carbon for taste and odor and activated silica to aid coagulation. Flowing into a horizontal type flocculating basin, the water is split to go to parallel units, of which there are two now, one to be added later. Two settling basins are in the original design, but one is to be added later when needed. The settling basins are equipped with mechanical sludge scrapers. After settling comes recarbonation for removal of excess lime and pH adjustment. Rapid sand filters are provided over the clear well. There are also facilities for pre and post-chlorination.

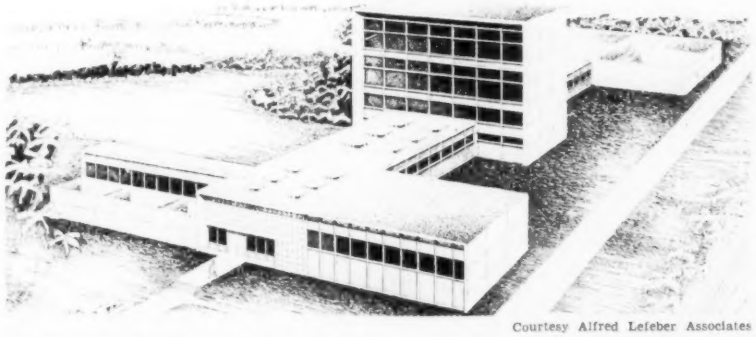
Ultra modern chemical handling facilities are to be provided for unloading chemicals from railroad cars. Pebble lime and alum will be carried by pneumatic conveyors to steel hoppers on the third floor of the treatment building. Activated carbon will be removed from cars and made into a slurry in a tank below the railroad tracks, thus avoiding the handling of dusty material inside the plant. Chlorine arrangements provide for one-ton cylinders to be delivered by car or truck. Activated silica will be obtained in liquid form, brought to the plant in tank trucks and put in storage tanks in the chemical feed room. There is to be provision for bagged chemicals in case of a breakdown of equipment.

Basically, the treatment plant is designed for three parts well water and one part surface water, but in periods of drought there may be need for more surface water. The Florida flood control project is expected to maintain the lake level under drought conditions even though the well field might not be getting needed rain.

The American Wells Works will furnish the flash mixer, the flocculating, sludge removal and recarbonization equipment, the latter in conjunction with Gas Atmospheric, Inc. Filter equipment and controls are to be supplied by Builders Iron Foundry, the chemical feeders by Omega and chlorinating equipment by Wallace & Tiernan. A high service pump to force water into the main distribution line will come from American Well Works.

A master control panel in the plant will enable one operator to exercise complete supervision over all main functions such as the raw water pumping equipment, all mixing and flocculating equipment, filters, chemical feeders and high service pumps. There is provision for individual samples to be taken from pumps for laboratory analysis.

This completely modern water works system has been designed to serve the community at least until 1978 without piecemeal additions. The three-story treatment plant will have a total of 22,500 sq. ft. of floor space consisting of a first and second floor, each 62 by 101 ft. and a third floor 63 by 63 ft. The control house is to be situated on the second floor.



Courtesy Alfred Lefeber Associates

● **ARTIST'S sketch of the water treatment plant for Melbourne, Fla. Capacity is 4 MGD with provision for doubling of capacity. Conventional treatment is provided.**

Strength Classifications

FOR ASBESTOS-CEMENT GRAVITY SEWER PIPE

DANIEL F. ALTEMUS,
Project Engineer,
Engineering Department,
Keasbey & Mattison Co.

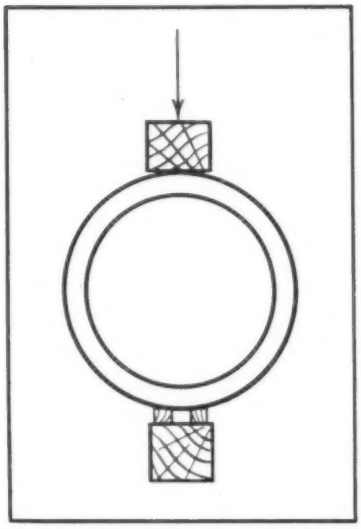
THE ASBESTOS-CEMENT sewer pipe manufacturers have recently made available asbestos-cement gravity sewer pipe in five new strength classifications. These five new classifications, or crushing strengths, will permit greater latitude in the design of sewer piping systems. The necessity in the past for supplemental strength to be provided by means of concrete cradling and concrete encasement may now be virtually eliminated.

Asbestos-cement gravity sewer pipe is now available in crushing strengths which range from 1500 to 5000 pounds per lineal foot. These are designated as Class 1500, 2400, 3300, 4000 and 5000. This wider range of crushing strengths, made possible through technological advances, will simplify the construction of future sewer projects and will provide greater safety factors for the design engineer.

One of the methods adopted to regulate development of subdivision areas has been to set up more adequate standards on minimum lot sizes. These requirements have increased the dispersal of the home units and in turn have increased the length of the sewer lines serving the homes. Furthermore, it has been the tendency to retain, wherever possible, the natural terrain of the suburban area by constructing homes which are adaptable to their surroundings. This tendency has produced more complicated problems for the engineer who is designing gravity flow sewer systems.

With the introduction of five crushing classifications for asbestos-cement sewer pipe, the problems of varying trench depths and types of soil will assume a minor role. Under the new classifications, sections of pipe of different crushing strengths, can be readily connected with one another through the simply constructed coupling principle. A chart showing the available sizes and crushing strength classifications is shown in Table No. 1.

The ASTM three-edge bearing test method has been accepted as the technique generally used for testing sewer pipe materials for their ability to withstand crushing loads. The new terminology of Class 1500, 2400, 3300, 4000 and 5000 indicates the ability of the pipe to withstand a minimum crushing load of these magnitudes when tested by the 3-edge bearing method, expressed as pounds per lineal foot. Therefore, a Class 1500 pipe, regardless of diameter, would be capable of sustaining a uniform minimum loading of 1500 lbs. per lineal foot. Likewise, Classes 2400 through 5000 would be capable of sustaining minimum uniform loadings of 2400 lbs. through 5000 lbs. per lineal foot.



● **DIAGRAM of the ASTM three-edge bearing test, which is generally used for testing sewer pipe materials for ability to withstand crushing loads.**

In 1913, Professor Anson Marston and A. O. Anderson, of Iowa State, presented a paper, "The Theory of Loads on Pipe in Ditches and Tests of Cement and Clay Drain Tile, and Sewer Pipe." This paper developed a formula, $W_c = C_c w B_c^2$ since known as the Marston Formula. Additional research since that time by Marston, Schlick and Spangler have further explained and supported this formula to the point where it is readily adopted for computations involving loads on underground piping. It has also been established that the manner of installation has an appreciable effect on the ability of the pipe to withstand the earth loads.

Various bedding classifications have been evolved for use with pipe materials adapted for use with the Marston Formula to compute the safe supporting strengths of pipe materials under various field condi-

Table 1—Safe Supporting Strengths in Lbs. per Lineal Foot for Various Beddings

Class	*Factor 1.1*	*Factor 1.5*	*Factor 1.9*	*Factor 2.2—3.4*
1500	1650	2250	2850	3300- 5100
2400	2640	3600	4560	5280- 8160
3300	3630	4950	6270	7260-11,220
4000	4400	6000	7600	8800-13,600
5000	5500	7500	9500	11,000-17,000

The available sizes and crushing strength classifications are as follows: 6 to 16 ins., Class 1500; 6 to 24 ins., Class 2400; 6 to 30 ins., Class 3300; 10 to 36 ins., Class 4000; and 10 to 36 ins., Class 5000.

tions. In the Spangler Report four methods of bedding for ditch conduits have been presented. These classifications and definitions are hereby reproduced with the permission of the author, Professor William Spangler. They are as follows:

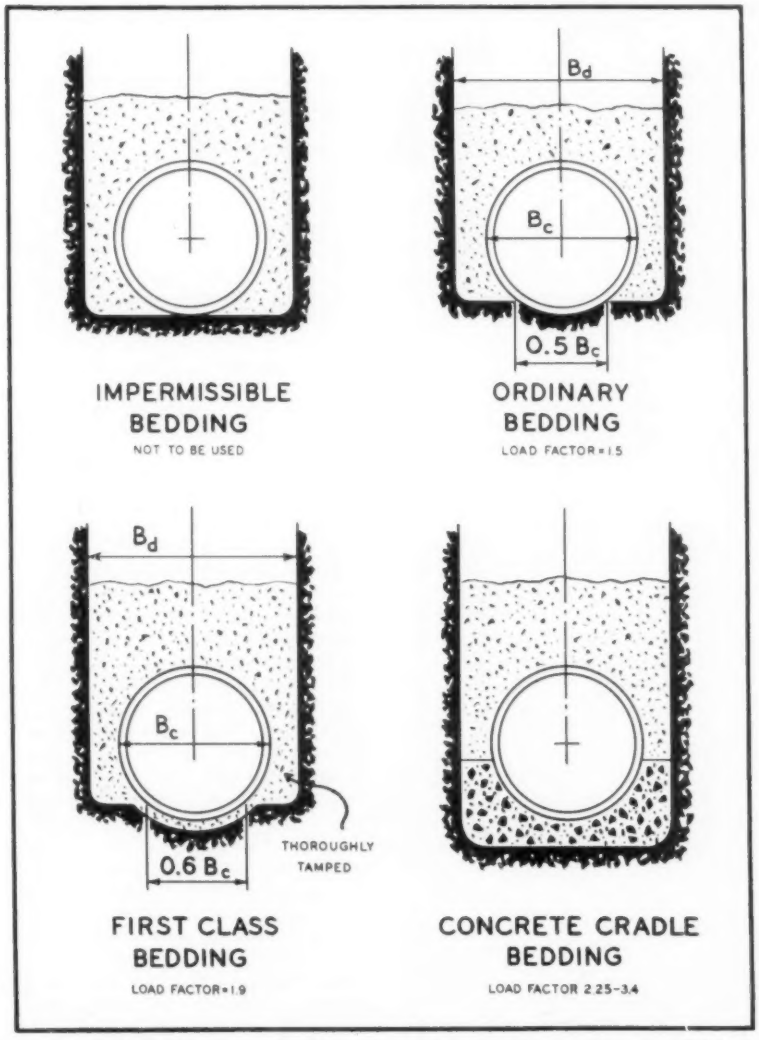
Types of Bedding

1. *"Impermissible bedding* is that method of bedding ditch conduits in which little or no care is exercised to shape the foundation to fit the lower part of the conduit exterior or to refill all spaces under and around the conduit with granular materials at least partially compacted.

2. *"Ordinary bedding* is that method of bedding ditch conduit in which the conduit is bedded with 'ordinary' care in an earth foundation shaped to fit the lower part of the conduit exterior with reasonable closeness for the width of at least 50 percent of the conduit breadth; and in which the remainder of the conduit is surrounded to a height of at least 6 ins. above its top by granular materials, shovel placed and shovel tamped to fill completely all spaces under and adjacent to the conduit; and all under the general direction of a competent engineer.

3. *"First-class bedding* is that method of bedding ditch conduits in which the conduit is carefully bedded on fine granular materials in an earth foundation carefully shaped to fit the lower part of the conduit exterior for a width of at least 60 percent of the conduit breadth; and in which the remainder of the conduit is entirely surrounded to a height of at least 12 ins. above its top by granular materials carefully placed by hand to fill completely all spaces under and adjacent to the conduit and thoroughly tamped on each side and under the conduit so far as practicable in layers not exceeding 6 ins. thick; all under the direction of a competent engineer represented by a competent inspector constantly present during the operation.

4. *"Concrete-cradle bedding* is that method of bedding conduits in which the lower part of the conduit exterior is bedded in plain or reinforced concrete, of suitable thickness under the lowest part of the conduit exterior and extending upward on each side of the conduit for a greater or less proportion of its height."



● **VARIOUS bedding characteristics and bedding load factors. See also Table 1.**

Spangler further stated, "It is feasible to establish and define classifications of bedding conditions covering a range of practical attainments and determine a load factor for each classification which, when multiplied by the 3-edge bearing laboratory strength of the pipe, will give the safe supporting strength for pipes installed in accordance with the definition of that classification." Using the 3-edge bearing method as unity, each classification of bedding was worked out experimentally to provide a strength ratio for each of the bedding methods. The load factors for the various bedding classifications were determined experimentally by Professor Spangler as follows: Impermissible bedding 1.1; ordinary bedding 1.5; first-class bedding 1.9; concrete-cradle bedding 2.2 to 3.4.

Applying the principles developed by Marston and his associates, who continued in this work, we can establish safe supporting strengths for the various new classifications of asbestos-cement gravity sewer pipe. These data, presented in Table 2, show the variety of earth loads permissible using the new asbestos-cement gravity sewer pipe classifications. We have assumed in these calculations that the use of a safety factor of one is adequate, based on our experiences and knowledge of asbestos-cement sewer pipe.

Assuming we have a Class 2400 pipe, we can see from the Table that any diameter in this classification would support a maximum load of 4,560 lbs. per lineal foot using first-class bedding methods. Using the Marston Formula, $W_c = C_d w B_d^2$ in which W_c equals the load in the pipe in pounds per foot; C_d equals a load coefficient; B_d equals the width of the trench; and w equals unit weight of the backfill materials in lbs. per cu. ft. C_d the load coefficient, is a

(*Continued on page* 116)

Should I Consider an ELECTRONIC COMPUTER?

CURTIS G. ANDERSON
and
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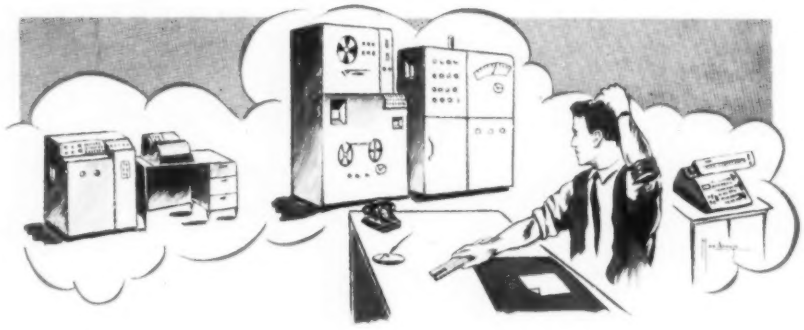


IMPRESSED BY the steady flow of tribute paid to electronic computers, many a consultant is asking himself: "Can I profitably use this highly publicized new method of computation in my own work?"

Surely any means of calculation that will virtually eliminate thousands of man-hours of earthwork computation or that will vastly simplify complex design problems is well worth considering. The total earthwork computation operation on 12 miles of rural 2-lane highway can require some 1100 man-hours of section and template plotting, planimetering and calculation. Similar operations for 12 miles of 4-lane dual expressway with, say, 3 interchanges and attendant service roads can require about 3000 man-hours. It appears obvious to a consultant that the use of an electronic computer will reduce these high man-hour requirements to the point where such a computer is mandatory.

It appears obvious, but we feel that a consultant must temper the apparent necessity to invest in an electronic computer with an analysis of just exactly what the machine can do for him. For example, an electronic computer can whiz through survey computations including traverses, coordinates, length and bearings, areas of closed traverses, error of closure and adjusted length and bearing. It can work out bridge geometrics, calculate sizes of bridge stringers, analyze continuous beams and frames, frames for bridge piers and multi-story buildings, deflections in structures, and facilitate the maintenance of continuously updated unit bid price records.

What are the advantages of electronic calculation? The most outstanding service such a computer can perform is the reduction of tedious, time-consuming computation. Engineers will agree that too many of their days are spent on routine "bull work". The electronic calculator is capable of accomplishing in a fraction of the time anything that can be worked out on a slide rule or desk calculator.

The electronic calculator, however, does have certain limitations. It is extremely difficult, for instance, to program earthwork computation for a dual highway with differing profiles and varying total roadway widths. Similarly, the electronic computer cannot be economically programmed to handle earthwork on complex interchanges.

The computer is a slave brain, not a thinker. It responds rapidly and with great accuracy to preset instructions known as a "program". Contrary to fairly widespread opinion, the computer will perform problems involving judgment—providing the required judgment can be reduced to machine terms. That is, the computer can be programmed to reject negatives and accept positives or to accept a number and reject zero, etc. However, judgment that cannot be reduced to machine terms must be made by the engineer before programming.

Steps In Solving Problems

Four steps are involved in the application of electronic calculation to an engineering problem:

1) Conception of the problem outline and its reduction to mathematical terms with consideration of all solution possibilities. (This step is accomplished manually by an engineer completely cognizant of the outline problem and at least familiar with its preparation for the computer.)

2) Translation of the mathematical sequence into machine language, or a "program", and preparation of load cards, wired program panels, punched tape, or combinations thereof. (This step is undertaken by an engineer or mathematician. He can be assisted by a technician.)

3) Transcription of specific problem data onto punched cards or tape, running it through the machine, and obtaining results in tabulated form. (An engineer can handle this phase with the assistance of a technician. The actual feeding of the data cards through the machine is probably the most glamorized part of the operation. It is now that the electronic calculator demonstrates its astounding ability to process mass data in seconds. This phase involves manual preparation of the data cards or tape, and automatic processing.)

4) Transcription of tabulated results for further use. (This manual step permits the engineer to utilize the tabulated data in subsequent work.)

Steps 2 and 3 are not to be confused. Step 2, programming, is a procedural operation. Once a program is satisfactorily established, the programming cards, tape or panels can be filed for unlimited reuse. Hence the cost of a specific program is a one-time-only cost.

Step 3, preparation of data for a specific problem, must be taken with each problem to which a given program is applied. Therefore, Step 3 is a recurring operation.

What is Available?

Consultants can obtain computers through outright purchase or rental. In addition, several computer manufacturers maintain service facilities where the use of computer installations is available at hourly rates. Many private companies have been

organized to provide similar access to electronic computers on an hourly fee basis.

Outright purchase involves outlays of at least $40,000. At the present rate of development, a computer purchased today will be approaching obsolescence in about 5 years. While this will not obviate a present-day computer's usefulness in the future, its substantial purchase cost can restrict a consultant to its use long past the point where he might fare better with new equipment. One advantage of purchase that cannot be overlooked, however, is that once a consultant has a machine of his own, he will be inclined to develop many additional applications to increase its usefulness.

A consultant contemplating the purchase of a machine cannot afford to base his choice on cost alone. Machines are available in vastly varying sizes and capacities. Selection must be influenced by the volume of work and its nature, ease of programming, cost of maintenance, and simplicity of installation. If the computer is to be used for many complex programs, a machine that can handle such extensive problems in a single application should be considered. Subdivided programs can be expensive and time-consuming. If, however, the consultant is faced with problems of a lesser complexity, he should consider a smaller machine. Occasional lengthy programs can be sub-divided to meet its capabilities. Machines utilizing punched tape programming are generally less costly than those programmed with cards or panels, but they are slower. Tape actuated machines fall in the price range of many consultants, and where speed is not of vital consequence, they may be entirely suitable.

Rental offers two impressive advantages over purchase: no large investment is required, and up-to-date equipment will always be available. Tape-fed machines such as the IBM 610 and Royal McBee LGP-30 differ considerably in several respects from data card machines such as the UNIVAC 120 and the much larger IBM 650. The IBM 610 and the Royal McBee LGP-30 rent for about $1100 per month; the Remington Rand UNIVAC 120 for $1350 per month; and the IBM 650 for $3750 per month. Prospective renters must bear in mind that these costs cover the computer only. Additional outlay will be required for rental or purchase of related equipment such as the keypunch, tabulator, interpreter, etc. As in the case of outright purchase, a rented machine may spend a depressing part of its costly time silently sitting in a corner.

An arrangement with a computer service company, either private or a manufacturer's subsidiary, permits maximum flexibility of computer use. Machine time is charged by the hour, and that cuts lost time to a minimum. There still remains the necessity for related equipment which can be purchased, rented for placement in the consultant's office, or rented by the hour at a service company. Programming can be undertaken by the consultant's trained office personnel or by the service company under the guidance of office engineers. Preparation of data for the service company's machine can be accomplished by the consultant's engineers and technicians.

The main disadvantage of the service company is its sometimes remote location. In Baltimore, the nation's sixth largest city, about a dozen firms presently offer varying degrees of programming, data preparation and processing. Two of these are manufacturer's subsidiaries—in this instance, the Remington Rand organization and IBM's subsidiary, the Service Bureau Corporation. Baltimore consultants are no more than a brief taxi trip from a service company. But what of the consultant located at an inconvenient distance from a service company? He will be forced to consider more seriously the possibilities of purchase or rental. Or he may join his fellow local consultants in forming a cooperative service company as one group of consultants has done in Illinois.

A factor that will force a highway consultant to ponder before making an investment in rental or purchase is the coming availability of machines in state highway departments. Several states have already secured their own electronic computers and are organizing program libraries, and consultants can expect to process their data cards or tape through these state machines. It is clear, then, that consultants considering electronic computation for highway work must determine the extent of their client's participation.

How Do I Get Started?

We have found it impractical to jump into the electronic computer business without a fairly detailed study. Probably the most important first step a consultant should take is to assign at least one of his engineers the task of determining the potential value of electronic computation. This engineer will find that his best approach will be through attendance at one or more of the short courses presented by various computer manufacturers, and discussions with manufacturers' sales representatives.

When the engineer assigned to electronic computation has completed his brief training, he can begin working out preliminary programs. This can be undertaken with the assistance of computer manufacturers, service companies, or by the engineer himself. At this stage, the consultant will become familiar with program libraries maintained by manufacturers, service companies, and agencies such as the Bureau of Public Roads. The availability of these prepared programs enhance the use of electronic calculation and greatly increase its value.

After using a service company, a consultant will be better able to judge the advisability of the rental or purchase. He will have discovered that programming and data preparation can be accomplished in his office. He will have an accurate record of exactly how many hours a computer was useful to him per week or per month; how many hours would have been "dead time" on a rented or purchased machine. If he decides upon subsequent rental or purchase, he will have found that the service company is available for the more complex problems, thus enabling him to obtain a simpler and less costly machine of his own.

The Baltimore firm of Whitman, Requardt and Associates entered the field of electronic computation by enrolling two civil engineers in a 3-week course presented by the Baltimore Office of Remington Rand. Following this course, one of the two engineers and another civil engineer completed an 8-day course presented by IBM in Baltimore.

These three men are currently engaged in programming computer applications for highways and structures. Further applications are being considered in traffic analyses, hydraulics, job changes and billing. Also being considered is the use of an electronic computer for payroll operations. Properly programmed, the machine can translate data into completed checks.

Of interest is a recent Whitman, Requardt comparison of manual computation with electronic computations for the mathematical solution of bridge geometrics. The program is set up to provide the

following data for each stringer: station, offset, coordinate and elevation of each end plus the midpoint. In addition, the length of stringer and the bearing will be provided. Bridges may be on a tangent, a spiral, curve or any combination thereof.

Our costs for manual computation, based upon previous experience, are estimated at about $400 to $1,200 per bridge, depending upon the complexity of the geometrics.

The costs for electronic computation of these bridge geometrics are split in two portions. A local service company has estimated the programming cost at $1,200. To this should be added a $250-$500 preprogramming cost of preliminary preparation done by the consultant. The programming includes writing the program into machine language, debugging the program, and punching a program card deck. It is important to note that this program deck will be retained by the consultant for future problems, hence this particular $1700 maximum programming cost is one-time only for bridge geometrics problems.

The second portion of the electronic computation costs for this bridge geometrics application is estimated as follows per bridge: 1) Preparing data for computation $100; 2) processing through the machine $25; and 3) transcribing data for further design $100. This adds up to about $225 per bridge.

The first of these latter three steps is accomplished in the consultant's office by a clerk supervised by one of the engineers trained in electronic computation. The second step is accomplished at the service company. The final step is undertaken back in the consultant's office by one of the trained engineers.

Thus anticipated savings per bridge should be between $200 and $1,000. One large contract with half a dozen bridges of medium complexity could more than amortize all previously incurred training costs and programming expenses.

More than Cost Savings

The substantial direct saving on salary and overhead that can be realized through electronic computation is just the beginning, but engineers need not fear replacement by a transistorized electric brain. More to be anticipated is the sizeable reduction of the tiresome computation that retards too many energetic and gifted men. Through well-planned electronic computation, engineers are able to take on a greater volume of work and to improve its quality. Machine computation encourages a broader scope of trial-and-error solutions, and can be programmed to reject unsuitable answers. The time-consuming procedure of manually checked computations is eliminated by checks built into the machine and by checking procedures that can be incorporated into programs.

Thus it is evident that cost saving alone is not the only justification of electronic computation. Even where costs of manual and electronic computation are about the same, the consultant can use electronic computation to great advantage. He can avoid the need for hiring temporary employees for unusually heavy work loads, and he can relieve his engineers of tedious and repetitive manual work.

Electronics or Not?

An electronic computer is only as good as the man who programs and feeds it. If a consultant cannot afford to release one of his engineers to full-time or near full-time computer work, then it is doubtful that he can use an electronic machine to full advantage. To the consultant whose work does not involve recurring complex calculations, the benefits of electronic computation are to be questioned. The machines can work minor miracles, but cannot substitute for engineering skill. Overinvestment is a sure road to disappointment.

A careful, informed approach to the matter of electronic computation will lead to lasting benefits. Hesitation to investigate these benefits may prove costly. And at some point in the future, a large consulting firm will find itself hard-pressed to compete without the employment of electronic computation. It makes sense to begin investigating now—but with deliberate care. As the president of IBM puts it, "In this business first comes illusion, then disillusion, then reality".

Aluminum Girder Bridge is Dedicated

CLIMAXING an extensive research and development program, the first aluminum girder type highway bridge in the world was dedicated recently, being opened to traffic with the cutting of a ribbon made appropriately of aluminum foil. A 222-ft. long, two-lane, four-span continuous girder structure with a reinforced concrete deck, the bridge is located on Clive Rd. and crosses Interstate 35 and 80, a four-lane express highway. It is 36 feet wide with a 30-foot roadway.

The aluminum bridge is a developmental project to demonstrate structural and fabrication advantages of aluminum and to stimulate broader use of the metal in the nation's huge highway construction program. The research and development were sponsored by the State of Iowa, Aluminum Company of America, Kaiser Aluminum & Chemical Corp., and Reynolds Metals Co. The bridge was designed by Ned L. Ashton, Iowa City consulting engineer. The aluminum fabrication was performed by Pullman-Standard Car Manufacturing Company, Chicago, and general contractors were Jensen Construction Company and United Contractors.

Four continuous longitudinal girders are used under the roadway spaced 9½ feet apart. The girder and diaphragm system is primarily of welded plate construction. The plate ranges in thickness from ½ inch to 1¾ inches. A typical main girder has a web ½ by 36 inches, a lower flange 1¼ by 18 inches and an upper flange ¾ by 12 inches. A typical diaphragm has a ½ by 23-inch web and 1 by 10-inch flanges. The concrete deck is tied rigidly to the aluminum shear connectors to achieve composite action.

● THIS Stephen-Canfield machine placed six miles of curb in two weeks. As much as 3900 feet were laid in one day. Location was Ohio Route 4, near Dayton. Photograph is by the author.

How Cities Cut Curb Costs

FRED SWINEFORD,
Highway Engineer,
Columbus, Ohio

THE COST of street curbs, traffic islands and gutters are now being greatly reduced by the use of modern machines which extrude asphaltic concrete and Portland cement concrete curbs, and curbs and gutters.

Typical examples are found in Detroit, Michigan, where the city owns two Stephens-Canfield curbers to place street curbs, traffic islands and barriers in parking areas. In addition paving contractors in the Detroit area own and use ten of these machines for public and private work. Miami, Florida, purchased one of these machines to place curbs to channelize traffic and control parking. New York city has channelized traffic at Nagel and Dyckman Streets by machine laid curbs. The State of Ohio, Franklin County around metropolitan Columbus, and Mahoning County around Youngstown, own and use automatic curb machines for traffic islands and drainage gutters.

The State of New York has a curber in each of its 11 highway divisions and Alabama has 25. There are 20 in California, and Massachusetts, Connecticut and Ohio have 50 each.

The Stephens-Canfield curber was developed several years ago by Superintendents Stephens and Canfield in North Carolina. It extrudes curb by means of a screw conveyor which forces the material through a mold. It is self-propelled and will form curbs of many shapes. The unit can lay 2,000 or more lineal ft. of curb per day with the use of 3 or 4 men. It is capable of putting down either asphaltic or cement concrete curb.

The Smith-Field curb and gutter machine is a similar and larger extrusion machine which is now being used in New York, Pennsylvania, Ohio, California, Florida and many other states to place many shapes of curb and gutter and medial dividers. This machine requires no forms and little or no finishing other than cutting of expansion and contraction joints with equipment that comes optional with the machines. In using this machine, a yard of cement concrete yields about 21 lineal ft.

The Smith-Field curb and gutter machine and the Stephens-Canfield automatic curbers are made by E. L. Hardin Associates, Salisbury, N. C. Other makers of curb machines are as follows: Miller Spreader Corp., Youngstown, Ohio; E. D. Etnyre & Co., Inc., Oregon, Ill.; Dotmar Industries, Inc., Kalamazoo, Mich.; and the Young Co., Waco, Texas.

● ASPHALT concrete curbs were laid by machine to form six traffic islands at the heavily traveled intersection of Dyckman and Nagel Sts., upper Manhattan, N. Y.

Fleet Maintenance Records Help City Cut Costs

PHIL HIRSCH

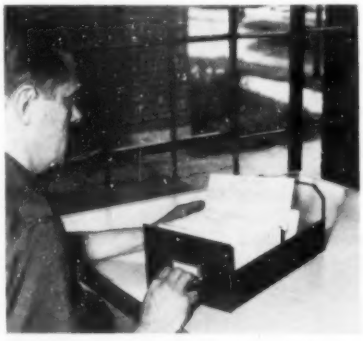
A DETAILED, continuous record of operating and maintenance costs has provided Winnetka, Ill., a village near Chicago, with a particularly effective tool for controlling the expenses of operating its municipal vehicles. Also, the utilization of this equipment has been markedly improved by this new program.

Fleet operating cost data has been collected by the Chicago suburb for some 30 years. The present system, in use since the end of World War II, embraces approximately 60 vehicles consisting of some 40 passenger cars and trucks, plus tractors, compressors, pumps and other types of gasoline-powered equipment mounted on wheels. Departments using these methods include police, health, public works, water and electricity.

In the village accounting office is an "automotive maintenance ledger" which contains a set of accounts, one for each vehicle in the fleet. At the end of the month, the municipal garage sends in data showing gasoline and oil consumption, plus total hours of shop labor expended during the period. This data, broken down according to vehicle account number, is then posted to the ledger. Purchases of major parts (tires, batteries, axles, etc.) are recorded in similar fashion.

Funds to cover the costs of operating and maintaining Winnetka's municipal fleet come from the budget of each department using the equipment. In essence, the public works department (which supervises vehicle maintenance) "rents" the units to itself and to the other village agencies, and "colllects" a fee based on the amount of use. No money actually changes hands. The accounting department merely computes the charges, debits the proper operating accounts, and credits the fund from which vehicle maintenance expenses are paid.

In the case of vehicles assigned permanently to one activity, such as refuse collection or street sweeping, the direct costs (gasoline, shop labor, and parts) are totaled, then billed to the proper account. Some vehicles (dump trucks and tractors, for example) are often used on more than one type of activity. Here, the monthly cost is split among the accounts covering each type of work. For example, if a given truck is used during one month to haul gravel for road work, dirt for landscaping, and supplies for water pipe maintenance crews; the costs of servicing and maintaining the unit for that period are apportioned among the three corresponding accounts—the first two, part of the public works department budget; the last one part of the water and electricity department's funds.



● **TIRE record cards show mileage, name of manufacturer and repair cost.**

The charge levied against each of these operating accounts is based on the number of hours the vehicle was used for the corresponding activity. The foreman in charge of each job to which the unit is assigned keeps track of this time, on a "monthly time and expense distribution" form, which is turned in to the accounting department at the end of the month.

Charges for "shared" vehicles are based on standard, rather than actual costs (although the latter are itemized in the ledger). Standard costs make it possible to distribute the burden of expensive maintenance evenly. For example, say that a given truck receives a major engine overhaul during one month when it is used for two separate activities. If actual costs were used, the operating accounts covering these activities would bear the total expense of the overhaul, even though the vehicle might be used for several other kinds of work during the remainder of the year.

Winnetka officials sidestep this problem by averaging the monthly direct costs generated by each major type of shared vehicle at the end of the year, and combining this average with those for the preceding two years. The result of this computation is the standard for the next year. In effect, the system amortizes the cost of expensive maintenance over most or all of the expected operating life of the vehicle involved.

With some 30 years of record-keeping experience behind them, Winnetka officials have polished the data-collection job down so that it produces the maximum amount of information with the minimum expenditure of effort.

Records Are Simplified

One way they have simplified the records, without losing any important detail information, is by itemizing only the major items of maintenance expense, that is, gasoline consumption (in gallons), shop labor time (in hours), and the cost of any major parts installed.

If a mechanic spends less than half an hour working on a particular vehicle, the cost of his time is charged to an "overhead" account that includes, besides garage overhead as such, these other items: the cost of spark plugs, tire valves, gaskets, and all other standard parts that cost less than $1.50 per unit; oil, grease, washing compound, and similar supplies; and vehicle insurance and license fees. Later, each using department pays a share of the overhead cost, based on the amount of gasoline, shop labor, and major parts it has been charged with.

With this arrangement, the shop has to fill out only 3 forms. One is a daily gasoline record, showing the gallons of fuel pumped into each vehicle. The second is a set of labor tickets, showing how the two mechanics and two servicemen distributed their time. The third record, made up monthly, lists the mileage traveled by each vehicle.

The accounting department, after receiving the above data plus the monthly time distribution form on

each shared vehicle, must collect one other set of figures before it is ready to bring the automotive maintenance ledger up to date. The last ingredient consists of the purchase orders that have been authorized during the preceding 30 days for major parts. Each of these purchase orders lists the vehicle account number for which the item is being obtained. If more than one vehicle is involved, the quantity listed on the order is broken down accordingly.

Once the hourly charges have been totaled for all shared vehicles, and the direct costs covering fuel, shop labor, and major parts have been computed for the others, the next step is to apportion the overhead expense. This is done simply by taking 15 percent of the monthly direct costs (or total hourly costs in the case of shared vehicles) and adding this amount to the total bill for each vehicle.

"We have found that in the long run our total overhead costs come to just about 15 percent of the other charges," explains Robert L. Anderson, Winnetka's Superintendent of Public Works. "Thus, even though our accounting system doesn't break down these charges by using department or vehicle, the possibility that we'll collect too much or not enough is eliminated for all practical purposes. And if there is a difference at the end of the year between overhead expenses and collections, the shortage or excess is apportioned among each using department according to the ratio which its direct or hourly vehicle costs bear to the total for the fleet.

One evidence of the record system's ability to save money is Winnetka's recent decision to buy its own police cars. During 1956 and 1957, these cars were rented, and prior to that they were village-owned. The original decision (to rent), and the latest one, both were based on a comparison of the costs involved under each method of operation.

In 1955, the last year during which Winnetka operated village-owned police cars, maintenance costs of the vehicles totaled approximately $15,000. During 1956, after deciding to rent, the village spent $12,500, or $2,500 less. This saving was reduced about 10 percent the next year because the rental agency increased its fee. At the beginning of this year, there was another increase, plus a charge of two cents per mile if a car was driven more than 25,000 miles per year.

Village officials, after checking the mileage records turned in by the garage, determined that this new arrangement would raise the monthly fee to $190 (originally it was $100) per car. They estimated, with the aid of the automotive maintenance ledger, that total costs of renting 5 police cars, plus the charges for fuel, washing, licenses and insurance (none of which was included in the fee) would come to approximately $16,500 a year. Then, using the 1955 police car maintenance and operating cost records as a base, officials computed the costs of acquiring and operating a village-owned fleet. This estimate totaled $11,800, nearly $5,000 less than the total for the rental plan. So instead of renewing its contract, the village purchased 5 new police cars.

Several years ago, the record system helped officials determine whether it would be more economical to collect refuse using three-man crews on four trucks or two-man crews on five trucks. Essentially, the problem boiled down to a question of the labor and truck operating cost per hour. The former figure was obtained easily from payroll records. The latter figure required some extensive calculation, but thanks to the ledger, all the basic data was available, and virtually no guessing was necessary.

Extra Truck Saves Money

Officials discovered that a 5-truck operation, using two-man crews, was considerably less expensive than putting three men on each of four trucks. (Winnetka's refuse collection operation is special in some respects: loaded trucks never have to travel more than 1½ miles to the village's sanitary fill, and the crews pick up refuse at the homeowner's back door rather than at the alley entrance to his yard).

Besides its record of fleet operating costs, the village also maintains a file on the performance of tires on each of its vehicles, which makes it possible to evaluate different grades and tread designs on the basis of wear and punctures.

In one case, for example, the performance of conventional vs. deep-tread tires was evaluated on two similar trucks used for refuse collection. The number of punctures was counted over a three-year period. During this time, a set of conventional tires rode 8,000 miles and suffered 20 punctures. The deep-tread tires, meanwhile, traveled 16,000 miles, but sustained only one flat. As a result of this comparison, Winnetka is now installing deep-tread tires on all its refuse collection trucks as the original (conventional) tires wear out.

● **DAILY record is kept of gasoline delivery to each of Winnetka's municipal vehicles as part of accounting process.**

● **GREASE jobs are among the maintenance expenses represented in the monthly summary of garage labor and costs.**

THE TOWN SUPERINTENDENT

THOMAS F. GLYNN,

Formerly Town Superintendent,

West Seneca, New York

IN MOST instances subdivisions do not fall from nowhere—they are a growing problem. Usually when subdivisions are developed they are not referred to as such and in most cases are not even recognized as such. If they were, I believe many of the conditions in the subdivisions of today would never have been allowed to grow to such proportions as often exist. By the time this new American mode of living is discovered to exist in a Town, the problems created have grown to such proportions that we highway superintendents find ourselves unable to cope with them. We also find there are no means of controlling to any degree the basic ideas of good installation of public utilities. Therefore, we must start at zero and insert the necessary requirements in ordinances so as to provide for good planning and installation of public utilities.

Every highway superintendent realizes the first requirement in subdivision control is good planning. This, of course, will vary as to size and location of his Town, and to what degree and rapidity subdivisions are expanding.

The town of West Seneca is a suburb of Buffalo, New York, and has grown from a rural township to one of urban classification in the past 15 years. At one time we did our own planning. This soon proved inadequate. A planning board was established consisting of local residents and it operated efficiently for a number of years, but due to the rapid growth of subdivisions it was discovered that laymen meeting once a month or so could not cope with the many ideas of subdividers and the local requirements demanded by Federal agencies. We now employ a planning consultant.

Planning not only controls the layout of streets and the installation of utilities in subdivisions but reaches into all departments of town government.

I will illustrate our progress in street construction. Many years ago, before we recognized that a subdivision was developing, we allowed anyone to lay out a street, without excavating top soil, establishing a grade or installing a specific type of material for street base. When the houses were constructed the highway was accepted. We soon learned better and decided to build all streets ourselves and charge $3 per foot to the subdivider or individual. In a short time we were faced with the problem of building so many streets that we were unable to complete the program much less provide the necessary maintenance for existing streets. Groping at any means to offset our lack of good planning, we took the next step of requiring all subdividers or any one building a new street to construct the street to our specifications except for putting on the double penetration top. Again this proved wrong. It was found there were more streets ready than money and time would allow to be completed. It is needless to state what the attitude of the people was who lived on streets which we were unable to complete. Now, due to a progressive procedure over the years, we require all utilities to be installed to our specifications by subdividers or others before any streets are accepted.

Along with the planning of street construction came planning of design and the required specifications. This has grown from dirt streets to the present requirements of 8 ins. of rolled base and either 3 ins. of double treatment asphalt, or a 2-in. course of bituminous concrete.

Drainage Problems

The next problem confronting us in subdivision control, and sometimes more essential than street construction control is drainage. Most developers show little or no concern about this matter. Sometimes it is due to ignorance of existing conditions; or it may be a question of finances. If the solution of the drainage problem is not found by the subdivider before the construction of homes, it is almost impossible to solve it afterwards, due to lack of funds and the attitude of the present home owner who can't understand why he should provide a way for storm waters when there wasn't any ditch or storm sewer on his property at the time of purchase. We have been able to control this to a reasonable degree by requiring the subdivider to furnish a detailed profile and contour map of all drainage ditches and storm sewers and the locations of the points of

● **TYPICAL completed subdivision required thoughtful planning and control of the street pavements, storm drainage, sanitary sewers, water supply and refuse service.**

AND SUBDIVISION CONTROL

runoff. By this means we are able to control culvert pipe sizes and storm sewer construction.

Sanitary Sewers

Another utility of paramount importance is sanitary sewers. We require installation of sanitary sewers, either a single line in the center of the street or two lines, one on either side. If constructed in the center of the street, all laterals must be run to the lot line and plugged. These plugs can be removed only at the direction of the highway superintendent. This is to prevent washing into the trunk line of mud, sand and other debris from open cellar excavations. All sanitary sewers are constructed on a special district procedure. Usually the payment of the bonds is spread over a 30-year period.

There are two methods of providing water service to our subdivisions. One is the Erie County Water Authority which takes over maintenance and supplies water and meters after the subdivider has made trunk line installation. The other is the same as sewer line construction on a special district basis. The district buys water from the Authority, does its own maintenance and bills its users. The water districts are self-supporting. There are no special assessments unless a major maintenance problem develops.

All the construction costs so far discussed are charges against either the developer or the residents on a special district basis.

One of the important services we supply subdivisions is refuse collection. This service is conducted on a once-a-week pickup of garbage and unburnable material. We have in the town of West Seneca 6 packer units of 16 cubic yard capacity. It is required that all garbage be wrapped and put in suitable containers, preferably a metal container, each container to have a net weight of not over 100 pounds. Also, all unburnable material, such as bottles, tin cans and iron is to be handled in the same manner. All brush and tree trimmings are to be cut and tied in bundles not over 4-ft. in length. We operate a 60-ton disposal plant for garbage handling and at the present are operating on a 9-hour basis. The cost of garbage and refuse collection is a general town charge and not a direct charge against a subdivision or its residents.

For subdivisions which do not have foot delivery of mail and, therefore, must necessarily have rural mail boxes, we have designed the type of box and specify the location for the placement of these boxes so we will not encounter difficulties in the winter time during the process of snow removal.

● **STREET LIGHTING is under general control of the Town Superintendent. On this street distribution is from rear lot lines, with overhead circuits for the lights.**

Street Lighting

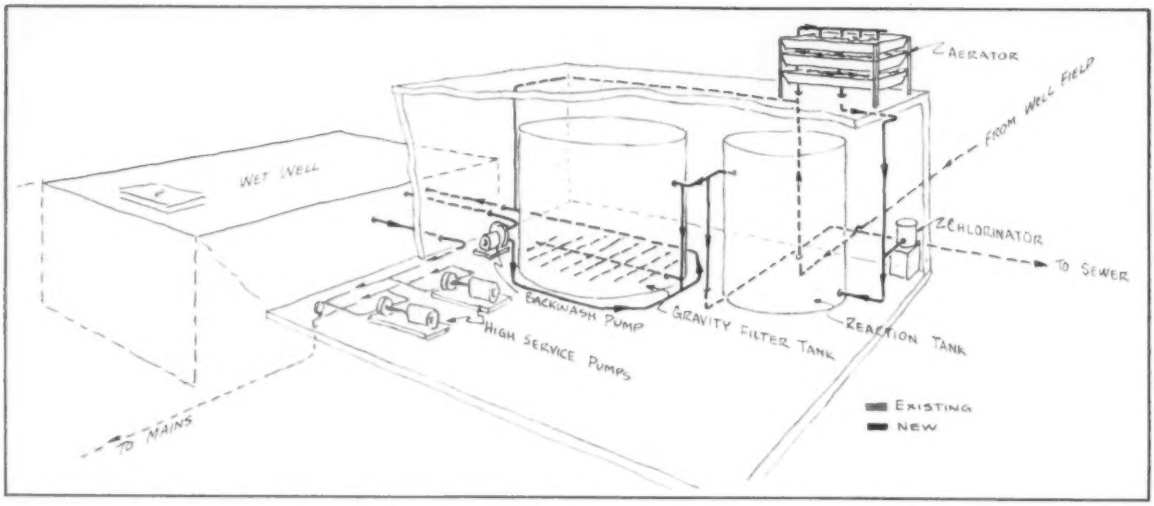
Street lighting service is supplied by contract with the New York State Electric & Gas Corp. and the Niagara Power Corp. in the area served by each company. The services provided include the installation, operation and maintenance of all street lighting equipment and facilities. The street lights burn approximately 4000 hours per year and this is a general town charge.

The development of a street lighting system in new subdivisions follows a fairly regular routine. When the streets have been accepted by the town and most of the new homes are occupied the utility serving the subdivision is requested to prepare a street lighting layout. Both the design and cost of the proposed layout is checked by the special lighting committee. If approved, a resolution is adopted at a subsequent board meeting ordering the installation of the lighting system.

All lighting units are mounted on wood poles and served by overhead conductors. Underground systems with steel poles are not considered for two reasons: (1) the considerably greater cost and (2) the inequality which would result in service rendered if underground feed was furnished in one area and not in another.

The design of a particular installation is governed by the location of the line poles carrying the distribution voltages. If the line poles are located within the highway limits, street lighting units are mounted on these poles. In recent years however, most line poles in new developments have been installed alone or adjacent to rear lot property lines. In these instances lighter and especially selected wood poles are installed in the street for lighting purposes only. The manner in which conductors are attached to these poles is dependent on lot depths. When building lots are relatively shallow (not over 140 ft. in depth) a twin twisted conductor is run

(*Continued on page* 151)



● **GENERAL ARRANGEMENT of the Albany, Ohio, water treatment plant, showing units added to improve water quality.**

AUTOMATIC WATER CONDITIONING at MINIMUM COSTS

GEORGE E. SHEETER,
Clark and Sheeter,
Consulting Engineers,
Athens, Ohio

A RESIDENTIAL community of about 1,000, with agricultural characteristics, Albany, O., has no industrial or commercial prospects. The public water supply previously consisted of a distribution system, wells and storage facilities. By 1957 the quality of the water was such that consumers were requesting that service be discontinued, due to "red water." Excessive amounts of iron and manganese, ranging up to 18 mg/L were present. Measures had to be taken to insure a supply of good water—at least 40 gallons per minute—and to do so at the absolute minimum of cost. Accordingly, the Board of Public Affairs retained the services of consulting engineers to study their problem and arrive at an economical solution.

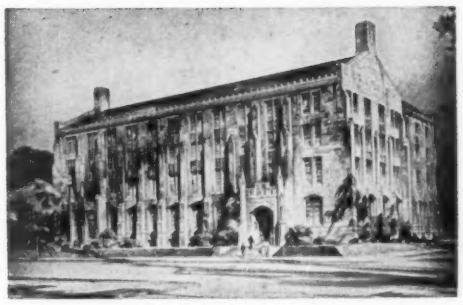
The first phase of the engineering study was an investigation of the possibility of securing better water elsewhere. Geological conditions and records of wells in the area indicated that it was highly improbable that better wells could be obtained. The topography of the area was such that a surface supply was not feasible. A study of the logs of existing wells indicated that attempted improvement might adversely affect the supply due, among other things, to proximity of brine layers.

It became apparent that the final solution would necessarily utilize the existing source of supply, that the quality of water would have to be improved through treatment and that the costs would have to be met on an emergency basis.

A design was developed, using existing facilities as much as possible. Nothing was discarded which could be utilized. One existing steel tank became a gravity filter; another, a reaction tank. Aeration and chlorination were provided. An underground tank was provided which served not only as a wet well for high service pumps but also as wash water storage for the filter. Since the Village was in a static position as far as population was concerned, it was determined that the plant would first be sized to the present population plus a very modest increase. Those parts of the work which could be expanded only with great difficulty were then increased to permit service for an estimated population increase of a twenty years' span. It was also necessary that the plant be almost automatic in operation, since the economics of the situation were such that no full time operator could be afforded. In refinement of design, the Engineers constantly considered the question of economy—economy in the long run as well as initially. As a final attempt to secure the maximum economy, the advertisement for bids was widely disseminated, particularly to smaller contractors who might be expected to do the work with less overhead and organizational costs.

As a result, William Loomis and Son of Logan, Ohio, were awarded the work with a bid of $12,769.08. Since construction, the plant has given very favorable results and the Village has water which is completely satisfactory. The engineers, Clark and Sheeter, of Athens, Ohio, report that they found a great deal of personal and professional satisfaction in solving a problem which was small in the affairs of the world but large to the people of Albany, Ohio.

APWA News BULLETINS



AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

1958 Public Works Congress Features Diversified Program

Kansas City, Missouri—Over 2,000 members and guests attended the 64th annual meeting of the American Public Works Association held in Kansas City, September 28-October 1. The Equipment Show was the largest ever sponsored by the Association. Public works officials from virtually every part of the United States and Canada were in attendance and visitors came from such far away points as Paraguay and South Australia.

Highlights of the annual dinner were an address by "Bill" Vaughan, Columnist, *Kansas City Star*, and the presentation of awards. Thirty-three members of the APWA received the Samuel A. Greeley Service Award, which is annually presented to members who have completed 30 or more years of continuous service with the same municipality. The Charles Walter Nichols Award with its $500 honorarium, for outstanding achievement in the broad field of sanitation, went to Arthur D. Caster, Principal Sewage Disposal Engineer, Cincinnati, Ohio. Mr. Caster was cited "for his imaginative leadership and originality of thought in successfully applying the use of closed circuit television to the internal inspection of difficult access sewers and to the underwater inspection of related facilities and appurtenances, thereby making it possible to perform this function in a safer and often more effective manner."

The 1958 *Engineering News-Record* Aid-To-Education Award of $1,000 went to David J. Vargas, who is a senior Civil Engineering student at the University of Michigan. Vargas, who reached his twentieth birthday in October, plans to work full time for the Michigan Highway Department upon completion of his education.

The first annual Harry S. Swearingen award, which was established to perpetuate the memory of the late Harry Swearingen, formerly principal Real Estate Agent for the Los Angeles Department of Public Works, went to 79 year old Walter N. Frickstand, retired City Engineer of Oakland, California, who was instrumental in organizing the Northern California Chapter of the APWA. The award, which consists of an attractive medal, is to be presented annually to a person selected by the Board of Directors in recognition of work performed on behalf of the Association.

General Sessions

The five general sessions were presided over by President Sol Ellenson, Director of Public Works,

● **LARGEST equipment show ever sponsored by the APWA, with 100 exhibitors.**

OFFICERS: Wm. D. Hurst, Winnipeg, Manitoba, Canada, *President;* Jean L. Vincenz, San Diego, Calif., *Vice President.* REGIONAL DIRECTORS: (term ending 1959) Albert G. Wyler, New Orleans, La; Edwin J. Booth, Bismarck, N. D.; Frederick Crane, Buffalo, N. Y.: (term ending 1960) Charles W. Cooke, Hartford, Conn.; R. S. Hopson, Richmond, Va.; H. H. Hester, Fort Worth, Tex; (term ending 1961) Louis H. Moehr, Wyandotte, Mich.; John A. Morin, Oakland, Calif.; W. A. Bowes, Portland, Ore. *Immediate Past President,* Sol Ellenson, Newport News, Va. Robert D. Bugher, *Executive Director*

Newport News, Va.; Louis Moehr, City Engineer, Wyandotte, Mich.; Lloyd Knapp, Commissioner of Public Works, Milwaukee, Wis.; William Bowes, Commissioner of Public Works, Portland, Ore.; and Robert Hopson, Director of Public Works, Richmond, Va. Papers presented included such topics as "The Adventures of a Public Servant" by Ethan P. Allen, Director of the Governmental Research Center, University of Kansas; a discussion of "Mass Transit" by W. J. McCarter, General Manager, Chicago Transit Authority; "Urban Renewal," which was presented by Joseph H. Ehlers, Asst. Commissioner for Technical Standards and Services, Urban Renewal Administration, Housing and Home Finance Agency. The technique of "Getting Things Done Through Others" was discussed by Herbert W. Starick, City Manager, Dayton, Ohio; Ray Nixon, Chief of Construction, Atlanta, Ga., spoke on "Inspection of Public Works Construction"; "Accident Prevention" was the topic of H. P. Goodin, Director of Safety, Minneapolis, Minn.; and Paul D. Haney of Black and Veatch, Consulting Engineers, discussed "Water Pollution Control."

"Curb, Driveway and Sidewalk Regulations" was presented by Lee J. Rothgery, Associate Engineer, Institute of Transportation and Traffic Engineering, University of California, Berkeley, who reviewed regulations governing curb openings as well as the advantages and shortcomings of vertical curbs, combined curbs and gutters and the "drive-over" type section. Driveway widths and ways of adapting the old driveway to the new car were also discussed. It was reported that only 37 percent of the city regulations studied required sidewalks to be constructed in new urban type subdivisions, but practically all cities are in accord as to specifications and construction methods for sidewalks.

"Stand-By Plans for Emergencies" was the topic of William E. Crockett, Director, Natural Disaster Office, U. S. Office of Defense and Civilian Mobilization, Battle Creek, Michigan, who stated that in natural disasters the greatest number of problems occur with streets and bridges, debris removal, sewage disposal and sanitary works, public buildings, levees and storm drainage works, and light, power and gas systems. An outline of pre-disaster planning including mobile radio communications, construction equipment and spare parts, equipment location, an inventory of skilled manpower and utility and routing maps was included in his presentation.

Technical Forums

Six technical forums were held during the Congress program. At each of the well attended forums interest was high and a lively question-and-answer period followed the presentation of papers. Typical of the forums was the one on "Collection and Disposal of Solid Wastes", which was chaired by J. D. Wright, Director of Public Works, Lynchburg, Virginia. At this session the need for extreme care in drawing up the basic provisions of a contract for refuse collection and disposal was emphasized by D. A. Anderson, Assistant City Engineer, Seattle, Washington. It has been found economically beneficial in Seattle to invite bids on a five-year contract permitting different per capita prices for each of the five years because of the rising price trends of materials, supplies and manpower. Theodore Winkler, Engineer of Waste Disposal, Detroit, Michigan outlined the factors influencing the

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This PAYLOADER® leads three lives

"its versatility and time-saving workability sold us"

says Riley Bates, Supt. Streets and Sewers, Eau Claire, Wis.

How many ways can a Public Works Department use a tractor-shovel? The Officials of Eau Claire, Wisconsin thought they knew all of them after six years of good service from a 4-wheel-drive model HM "PAYLOADER". But in early 1958 they decided to buy a new, more modern unit.

Buy three attachments

They decided on the 7,000 pound-carry-capacity "PAYLOADER" with a 4 cu. yd. snow bucket, a Ram Pick-up street sweeper attachment and a Drott "4-in-1" bucket — the latter on a trial basis.

As Riley Bates, Supt. of Streets and Sewers, put it, "We purchased the 4-in-1 bucket on a trial basis with an opportunity to exchange it for a regular bucket if not satisfied, but its versatility and time-saving work-ability sold us in short order."

All around the town

The day this photo was taken is a typical example of how the "PAYLOADER" is busy continuously from one end of the city to the other. In the forenoon, it cleaned up earth that heavy rains had washed over paved streets. After lunch, it loaded two trucks with road patch material for the maintenance crew. Next, it traveled to a new subdivision on the edge of town and excavated to improve the drainage on a dead-end street.

Winter and Spring "Specialist"

In the Winter when snow-removal is the big chore for the Street Department, the big 4 cu. yd. snow bucket quickly replaces the 4-in-1 bucket and the "PAYLOADER" becomes a high-capacity snow-loader to clean up streets, alleys, and parking areas.

In the Spring after the last Winter snows are gone, Eau Claire has 167 miles of streets to "house-clean". That's when the Ram pick-up sweeper attachment replaces the snow bucket and the "PAYLOADER" joins the city's regular sweepers to get this job done as quickly as possible. With the ability to dump its accumulated loads directly into trucks, the "PAYLOADER" with the Ram attachment has an added advantage over conventional sweepers.

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decomposition and settlement of landfills and their ultimate usage as time, moisture, compaction and the character of refuse incorporated into the fill. Mr. Winkler pointed out that a study of the various factors affecting the operation and utilization of sanitary landfills would be most desirable and that more knowledge would permit filled areas to become economic assets to a community in a shorter period of time. The change in the character of refuse, advent of mechanical stoking, greater competition, air pollution control, the labor problem, and skyrocketing construction costs were singled out as changes of great significance by Carl Schneider, Consulting Engineer, New Orleans, Louisiana in a paper on Incinerator Design and Operation. The layout and scheduling of refuse collection routes in Winston-Salem, North Carolina was described in some detail by R. W. Neilson, Director of Public Works of that city. The benefits of engineering analysis and follow through employed in the study included better service as well as an annual saving of about $50.000.

Other forum topics were Streets and Highways in Urban Areas; Municipal Sewerage and Drainage Systems; Maintenance of Municipal Streets; Purchase and Care of Public Works Equipment; and Design and Maintenance of Public Buildings.

Urban Expansion—A Symposium

The final technical session of the 1958 Congress was a well-attended Symposium on Urban Expansion. Roy Owsley, City Consultant, Louisville, Kentucky served as Chairman and endeared himself to the participants by not only stimulating technical discussions but also by apprising the group of developments in the World Series opener at Milwaukee. Principal Speaker George H. Deming, Director, Conference on Metropolitan Area Problems, New York, presented a statement on four general areas which commentators on Metropolitan problems agree are problem areas: 1) Territorial and jurisdictional problems; 2) organizational problems; 3) fiscal problems; and 4) political problems." In his commentary on Mr. Deming's remarks, Kenneth K. King, Director of Public Works, Phoenix, Arizona, emphasized the importance of annexation as an answer to the urban expansion problem in his area. Warren Smith, Sanitary Engineer, U. S. Public Health Service, Washington, D. C., outlined certain of the environmental health implications of the urban expansion problem, and D. C. Wesche, City Manager, Manhattan, Kansas, described the smaller community's problem in this respect.

Collector's Item

A new documentary film, "Collector's Item," covering the story of the establishment of a municipal (combustible) rubbish collection system in Los Angeles, California, was shown through the courtesy of the International Harvester Company. The film, basically a story about dedicated public works men, was produced as a public service. Present to relate the background of the film's development was C. A. Palmer, Hollywood, California, its producer and M. F. Peckles, Director of Consumer Relations for the Harvester Company. L. W. Pierson, Manager of Sales, Motor Truck Division of International Harvester presented the first print of the film to President Sol Ellenson and President-elect William D. Hurst. The presentation was made as a tribute to public works employees.

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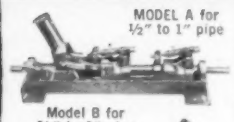

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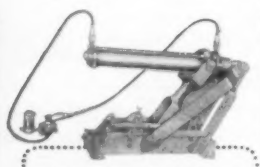

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Model A weighs 65 lbs.—requires only 5' trench. One man can easily install the average service. 15 tons of pushing pressure possible.

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NEW AIR POWERED
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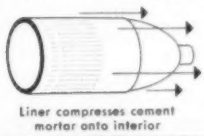

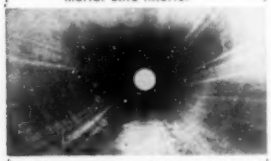

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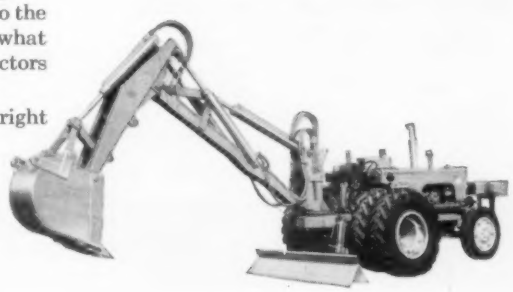
Your dependable Oliver distributor will gladly demonstrate right on your own job. Call him today. Or write for literature.

OLIVER Model 80 Hydro-Trencher—available with gas or diesel power, six forward speeds to meet every need for travel and power. Dual hydraulic controls permit raising or lowering bucket while swinging to give you a fast digging cycle. Here's bigger production than you'll get with ordinary equipment of this type.



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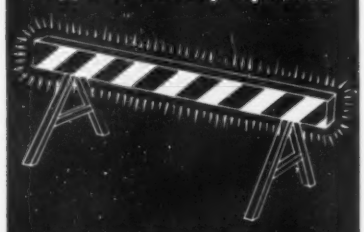

Mark road hazards for eye-catching reflectivity and brilliance with Type H Safety Spheres at just pennies per square foot. Easy to apply with ordinary traffic paint. Fully effective — long lasting — economical. Write for details.

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Herbicide Experiment on Maryland Roadsides

A field demonstration of two new herbicides was conducted for the Maryland State Roads Commission last summer by the Dow Chemical Co. The demonstration took place on Route 111, the Baltimore-Harrisburg Expressway, north of the Timonium Road Interchange. Members of the State Roads Commission's Landscape and Maintenance Departments witnessed the application of the new herbicides.

The two herbicides demonstrated were a systematic weed and grass killer and a soil sterilant. The two chemicals were applied along a 200-foot section of guard rail and to two sign posts, the chemicals being applied to a small area around the base of each individual post. Untreated control sections were left between treated sections to evaluate the effectiveness of the treatment. The test section will be inspected periodically by the Landscape and Maintenance Departments to evaluate the results for effectiveness, appearance and economy of use.

• • •

Wisconsin Water Supply and Treatment

Approximately 65 percent of Wisconsin's population is served by 559 water supply systems. Of the 559 water supply systems as of January, 1958, 446 were utility water systems and 113 were subdivision systems. All but 7 utility systems are municipally owned. Two water supply systems are privately-owned with municipal distribution.

The water supplies serving 36 utilities are from surface sources and there are 410 utilities which receive their water from ground supplies. Although the number of surface supplies are comparatively few, they serve a population nearly equal to that served by ground water supplies.

Public water supply systems have been installed in 21 Wisconsin villages since 1950, and in four towns while new water treatment plants have been installed in 10 cities.

• • •

Strength Characteristics of Asbestos-Cement Sewer Pipe

(*Continued from page* 101)

function of the ratio of the height of the fill to the width of ditch expressed as $\frac{H}{Bd}$ and the coefficient of internal friction of the backfill soil. It is possible to calculate a set of conditions relative to depth of trench, width of trench and type of soil where this classification of pipe could be safely used.

Assuming a trench width of 42 ins. and a soil with a weight of 100 lbs. per cubic foot we can compute that the Class 2400 pipe, regardless of diameter, could safely be buried in a trench in excess of 30 feet in depth; and if we were to increase the width of the trench to 5 feet using the same soil weight we could use this classification of pipe at a depth of 16 feet in the trench.

Recently H. H. Benjes presented a new concept of the bedding factors developed by Professor Spangler and his associates. The paper presented at the conference on "Conduit Strengths and Trenching Requirements" held at Washington University, St. Louis, Mo., recognizes problems inherent in obtaining the bedding factor values during actual construction. Benjes points out that modern-day construction methods coupled with modern-day costs make it unrealistic to suppose that the bedding factors calculated by Spangler can be obtained easily and economically during actual construction. The paper points out several methods of utilizing the bedding factors with a new method of construction that is consistent with our present day methods and costs. It is further pointed out that the new methods do not alter the bedding factor calculations and can be readily applied using the previously determined numerical values. It is felt by the writer that this concept is entirely reasonable in its approach to the problem of adequate bedding of sewer pipe materials in light of present day construction problems.

The new classifications of asbestos-cement gravity sewer pipe can be employed with this new concept of bedding further to enhance and supplement the values to be obtained through this construction method. Inasmuch as the asbestos-cement sewer pipe has 5 crushing classifications based on the ASTM 3-edge bearing method, the design engineer can be more than ever secure in the knowledge that adequate safety factors have been provided. The long lengths simplify the proper placing and grading of the gravel. The new classifications will be utilized to the maximum if the various bedding methods required can be obtained simply and economically by the contractor. This, in turn, will permit the design engineer to reduce the provision for safety factors to compensate for problems of construction.

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Chain link fencing of Alcoa® Aluminum, for highways, divider strips and rights-of-way, is a bigger bargain than ever: the premium you pay for aluminum now amounts to *less* than the cost of one routine painting of ordinary metal fencing.

From this point on, you're money ahead with aluminum. This was proved recently by examination of an aluminum fence installation in Pittsburgh. Installed 30 years ago in a continuously corrosive atmosphere, it is still standing today and will probably live to be 100! The aluminum still has its original structural soundness and good looks . . . has never cost a penny in maintenance.

Long-life, trouble-free installations like this are typical, but check the many other exclusive advantages you get with fencing of Alcoa Aluminum:

- **High Strength**—Average tensile strength of Alcoa's new alloy is 57,500 lbs/sq in.
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- **Readily Available**—Reliable manufacturers and erectors in all 48 states can supply Alcoa Aluminum fencing and accessories. For the name of the supplier in your area, contact your nearest Alcoa sales office.

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PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE WATER WORKS DIGEST

New Dam and Tunnel Project

The New Haven (Conn.) Water Co. completed in 1957 the North Branford Development, thereby consummating a nine-phase system containing 19 reservoirs and over 900 miles of water mains. This system can adequately serve the 300,000 residents in New Haven and 11 surrounding communities for the next 25 years. No treatment other than storage and chlorination is necessary for this water supply designed and developed over a period of more than 25 years. Today, the company's supply sources collect and store runoff from a developed watershed of over 120 square miles. The total storage is over 21 billion gallons. Details of dam and tunnel construction are presented.

"New Dam and Tunnel Project Completes Nine-Phase System." By Joseph A. Novaro. *Water Works Engineering*, September, 1958.

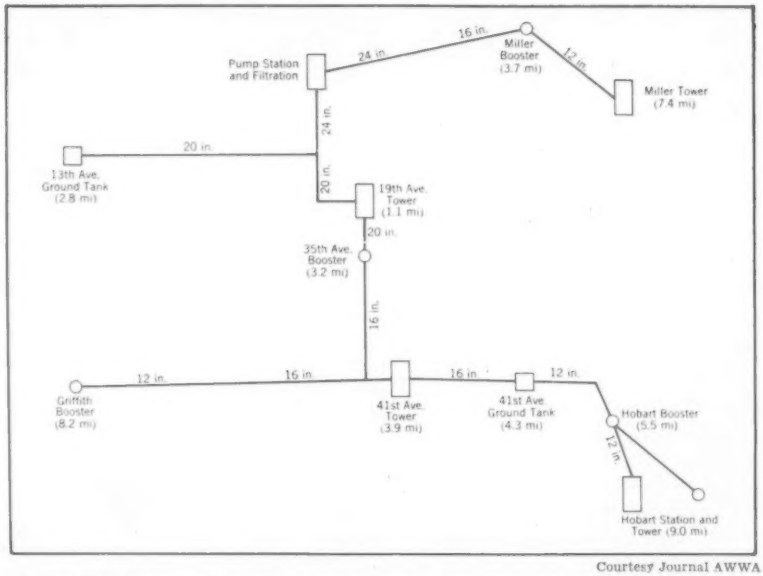
Chlorine Residual Persistence

This article is a report of an investigation to determine the stability and persistence of the combined available chlorine residual throughout extended distribution systems. USPHS personnel, in cooperation with the Division of Sanitary Engineering of the Indiana State Department of Health, made the study at the Gary-Hobart Water Corp., Gary, Ind., which has an extended distribution system. The treatment plant takes water from Lake Michigan, provides conventional chemical coagulation, rapid sand filtration with prechlorination, and a free available chlorine residual. Two portable chlorine residual recorders were used; one at the water treatment plant and the second was installed at the various locations of the distribution system ranging from 3.7 to 9.5 mi. from the treatment plant. Results of the study indicated that persistence of a combined available chlorine residual was demonstrated and could be maintained although several factors tended to modify it. A significant factor observed was the extreme loss of chlorine residual in the system with only a 3-5° F. rise in water temperature above 65° F. On the other hand there was practically no loss of residual in the distribution system during those times of the year when the water temperature was below 65° F. The author suggests that more attention should be given to reservoir inlet and outlet locations and to adequate baffling to provide a proper flow pattern and prevent short circuiting in reservoirs. The use of chlorine residual recorders to spot immediately any effort at sabotage through the addition of bacteriological agents was also suggested.

"Persistence of Combined Available Chlorine Residual in Gary-Hobart System." By Herbert L. Plowman, Jr. and John M. Rademacher. *Jour. AWWA*, September, 1958.

Stray-Current Problems

This article discusses the problem of stray-currents on underground piping resulting from sweeping changes in transit systems brought about during recent modernization programs. Most of these modernization programs have generally fallen within one of the following categories: 1) Partial conversion from d-c-operated trolley cars to trackless trolleys and diesel-powered buses; 2) complete conversion from d-c operated trolley cars to d-c-operated trackless trolleys and diesel-powered buses; and 3) complete conversion from d-c-operated conveyances to a system consisting entirely of diesel-powered buses. A number of relatively new and very severe stray-current problems have been encountered in many communities. These new problems are the direct result of the attempts by traction officials to achieve economies, without due regard for underground structures operated by other agencies. The two principal causes of severe electrolysis problems are: 1) Operation of traction systems at extended distances from substations and 2) use of abandoned trolley rails as primary return-current carriers. Several illustrations of both hypothetical as well as actual traction systems aid in the discussion. The in-



Courtesy Journal AWWA

● **WATER distribution system of Gary-Hobart, showing pipe sizes and distances.**

One of two Permutit Automatic Valveless Water Filters at O. M. Scott & Sons Co. Chemical Products Plant, Marysville, Ohio. Each filter is 7' diam. and rated at 116 gpm. The complete Permutit water-treatment system was engineered by H. A. Williams and Associates, Columbus, Ohio.

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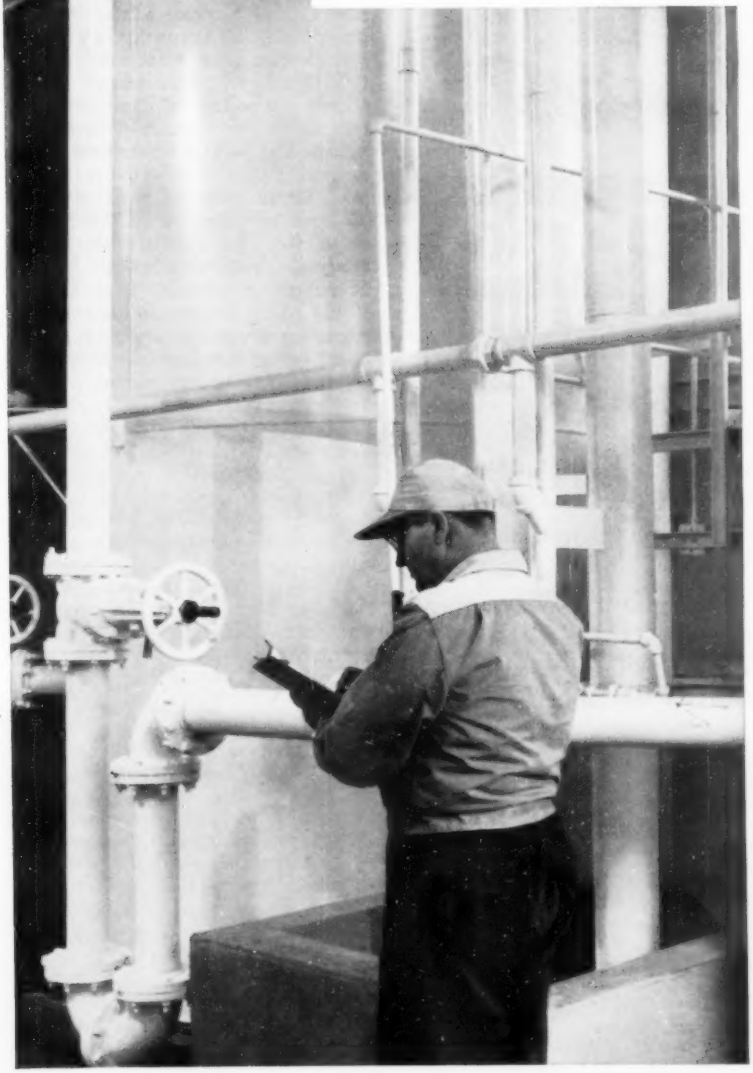

- These filters have been operating continuously for over a year and a half . . . supplying water for process, boiler feed and drinking. They follow a Permutit Precipitator that treats raw well water with lime, soda ash and coagulants. Either filter can handle full feed rate during inspection or repairs on the other.

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- The Valveless Filter is completely automatic—yet costs up to 45% *less* than conventional automatic gravity filters because it uses no expensive valves, flow controllers, pumps or hydraulic or pneumatic control systems.

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stallation of cathodic protection systems by the water utility or other utilities is also considered. The author suggests that water utility operators be thoroughly familiar with the consequences of stray currents and methods of alleviating these problems.

"Stray-Current Problems Created by Modernizing Direct-Current Traction Lines." By Hugh L. Hamilton. *Jour. AWWA*, September, 1958.

Iron Bacteria

This article is a discussion of an extensive study of the cultivation, morphology, and classification of iron bacteria made by the author with the support of the National Science Foundation. The method of cultivation consists of using ferrous sulfide as a continuous source of ferrous iron as a nutrient. The ferrous sulfide is combined with melted agar at 45° C. This mixture is slanted in screw cap tubes. A liquid medium consisting of ammonium chloride, dipotassium phosphate, magnesium sulfate and calcium chloride in the appropriate amounts is then added to the tubes. Carbon dioxide is bubbled through this medium for 10-15 sec. before it is added to the test tubes. The tubes may then be inoculated with a drop of a suspension containing the *Gallionella* deposit from a water main, aeration tray, filter bed, or other natural source. *Gallionella* grows well at room temperatures, and colonies usually appear in 18-36 hr. after inoculation. Several excellent photomicrographs of colonies of iron bacteria are shown in this article.

"Cultivation, Morphology, and Classification of the Iron Bacteria." By Ralph S. Wolfe. *Jour. AWWA*, September, 1958.

Memphis's Water Pumping Station

In May 1958, the City of Memphis dedicated the first of two pumping stations and well fields designed to meet the water needs of the rapidly growing areas adjacent to the city and subject to annexation within a few years. The station located northeast of the city on a site of 36.9 acres has a daily capacity of 15,000,000 gallons. Raw water discharges to a 14 unit coke tray aerator which causes the release of dissolved carbon dioxide and traces of hydrogen sulfide. The aerated water then flows through a venturi tube to four rapid sand filters each designed to filter 3.2 gpm or a total of 3.75 mgd for each unit. The filtered water normally is not chlorinated but a chlorinator is available if needed. A 10 mg covered concrete reservoir is used for storage and sufficient space is available for a duplicate reservoir. Three DeLaval centrifugal pumps powered by Westinghouse electric motors pump water from the reservoir into the distribution system through dual 30-inch cast iron mechanical joint pipelines. The project amounted to $1,189,000, exclusive of the two power feed circuits from the substations to the station grounds.

"Memphis, Tenn. Dedicates Water Pumping Station." By Ellsworth L. Filby. *The American City*, September, 1958.

Remote Control System

The phenomenal growth of the San Gabriel Valley Water Department during the past 20 years (an increase from 1,146 customers in 1937 to 45,046 service connections in 1957) has necessitated the installation of telemetering and remote control equipment to help counteract these problems and provide a more efficient method of maintaining and improving service. The Company operates in three separate divisions: 1) The Fontana Division comprising some 42 square

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WITH GRAVER REACTIVATORS®

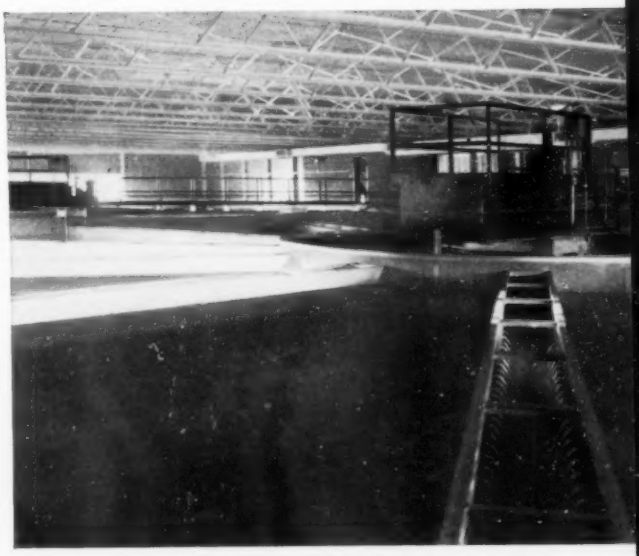
MEETS THE NEEDS OF HIGHLAND PARK, MICHIGAN

With the growing demand for water by community and industry, the City of Highland Park outgrew its conventional settling plant and old pumping station. To meet its needs, Highland Park built a booster pumping station and installed a high-rate treatment system consisting of two 11 mgd Graver Reactivators.

The Graver Reactivator is an up-flow solids-contact unit which incorporates four distinctive design features geared to provide effective clarification. These features are controlled sludge recirculation, low sludge level, separately driven and variable speed impeller and overall sludge removal.

At Highland Park, water supply is drawn from a lake water which forms very light floc and might have been difficult to clarify. But the Graver Reactivators have proved ideal for this water because their design features work together to provide the effective floc formation which results in excellent removal of turbidity.

To-date, the Graver Reactivators have delivered clarified water with turbidities not exceeding 0.3 parts per million. Effluent from the filter plant is so pure that it is difficult to measure accurately.



The Graver Reactivators operating in the new water treatment plant at Highland Park. Each of the units is 80 ft. sq. x 21 ft. 6 in. high.

GRAVER

Municipal Water Treatment Dept. M-421
GRAVER WATER CONDITIONING CO.
Division of Union Tank Car Company
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Write for the complete story of Highland Park in a new reprint, T-164.

miles and 13,456 connections; 2) the Whittier Division which serves 11,336 connections; and 3) the El Monte Division serving a total of 20,257 connections. Since December 31, 1957 the 20 pumps and 5 reservoirs serving this system have been under central control. Two types of supervisory and telemetering equipment are used, one being an audio tone system, the other a pulse width selector. The audio tone telemetering transmitters intermittently key associated transmitters. In the case of level and pressure variables, the duration of the keying is proportional to the value being measured. For the rate of flow, the frequency of or number of keyings varies with the value being measured. As the receiver bandpass filters are sharply tuned and have a high degree of selectivity, many signals may be transmitted over a single carrier. On ordinary telephone wires a single pair may carry from 20 to 25 separate signals simultaneously. The pulse width selector system is used between the Central Control Station for one or more remote pumping stations, utilizing a single voice quality telephone pair. Combined audio frequency multiplexing and pulse width selectors now provide central control for 38 percent of San Gabriel Valley Water Company's El Monte Division pumps. Quotations are currently arriving for control equipment for an additional 20 pumps and 3 tanks at three plants. The Whittier Division with 34 pumps will be considered next. Cost of control equipment for a typical plant of 2 or 3 wells, a storage tank and 4 to 8 boosters has been $5,000 to $7,000.

"Telemetering and Remote Control System." By Kenneth L. Wilkerson and M. E. Mosely. *Water and Sewage Works*, September, 1958.

Enteritis Epidemic

The authors report on the misuse of an automatic lawn sprinkling system which led to the contamination of the Shreveport, La., water supply resulting in an epidemic of enteritis in which 72 individuals became ill. As soon as the Health Department was notified that several members of one family were sick, a thorough sanitary and epidemiological study showed what had occurred to bring about this epidemic. It was discovered that a cross connection had been made between the city water supply and the bayou water used as a supply for a home owner's lawn sprinkling system. Further investigation showed that a broken sewer drained into the bayou, resulting in the ultimate contamination of the city water supply. As soon as there was definite proof of a direct connection between the bayou water and the city main, the cross connection was severed and the people in the area were advised not to drink the water or to boil it before use. The data collected showed that a total of 72 individuals developed enteritis, none fatal, in 27 households whose population was approximately 125. The attack rate, therefore, was about 60 percent. As a result of these events, the Shreveport City Council adopted an emergency ordinance requiring that all sprinkler systems be registered with the plumbing inspector, and the plumbing board urged that the plumbing code be enforced to the letter.

"Epidemic of Enteritis Blamed on Cross Connection." By Floyd M. Miller and Ben Freedman, M.D., M.P.H., PUBLIC WORKS, October, 1958.

Other Articles

"Corrosive Water Survey Leads to **Liquid Caustic Soda Treatment.**" The purchase of 50% solution, and dilution to 25% strength for automatic dosing, is found convenient, safe, and economical. By Howard Brown. Water Works Engineering, September, 1958.

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Engineers and water works officials prefer cast iron for small water mains for the same reason that they use cast iron for large mains—cast iron lasts for centuries!

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Most water waste is not willful — just forgetful — forgetting the hose is running, forgetting to shut a faucet tightly, forgetting to get a leaking faucet or toilet valve repaired. When American Meters are on the job, accurately registering such waste, forgetfulness disappears. Plumbing leaks are quickly repaired. With less waste, equipment is able to meet peak requirements at full pressure.

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"Pennichuck Water Works." The author reviews the interesting **history of this privately owned company**, its growth and development, and its present facilities and operations. By Don C. Calderwood. Water and Sewage Works, September, 1958.

"Water Works Budget," for Akron, Ohio. The author discusses **how the budget is prepared** and the accounting procedures used. By Wendell R. LaDue. Water & Sewage Works, September, 1958.

"Effects of Missouri River Basin Control on Water Quality." This is a panel discussion on the principal effects on the **water quality** of the cities downstream from each of the four dams already completed on the Missouri River. By Melvin P. Hatcher and others. JAWWA., September, 1958.

"Michigan's Largest High-Rate Water Treatment Plant." A description of the **high-rate water treatment** plant recently placed in operation in Highland Park, Mich., a city completely surrounded by Detroit. By Vernon L. Hinebrook and John L. Scheid. Public Works, October, 1958.

"Additional Water Supply for the New Haven Area." This system furnished, in 1957, an average daily draft of 44 million gallons to over 300,000 people in 12 separate communities. By Ernest W. Whitlock and Robert D. Mitchell. Public Works, October, 1958.

"Robotry in Water and Sewage Works Operation." A discussion of **the forms of telemetering**, and how they work, together with their application in water and sewage works operation. By B. D. Dickson and Clayton H. Billings. Public Works, October, 1958.

"Prestressed Pressure Pipelines for Athens Aqueduct." A detailed account of the methods adopted for manufacturing, transporting, placing and testing the 25-mile extension to the aqueduct supplying the City of Athens, Greece. By Peter J. Doanides. Civil Engineering, September, 1958.

"New England Area has **50-Year Water Supply**." This article contains excerpts of the report of the New England-New York Interagency Committee to Congress on the natural resources of one of the nation's most populous and industrialized regions. Water Works Engineering, September, 1958.

● ● ●

National Conference on Air Pollution

Public works officials throughout the country have been invited to attend the National Conference on Air Pollution, to be held November 18-20 at the Sheraton-Park Hotel in Washington, D. C. Of particular interest to city, county, and State public works authorities will be the informal panel discussion to which one full day of the Conference will be devoted and which will feature such topics as "The Control of Community Housekeeping by the Public Works Official." These sessions will also cover the sources of air pollution and its effects, and on these aspects, too, community and State representatives will have an opportunity to take part.

Full information may be obtained by writing the National Conference on Air Pollution, Public Health Service, U. S. Dept. of Health, Education and Welfare. Washington 25, D. C.

Minnesota Wastes Engineering Conference

The University of Minnesota will hold its Fifth annual Wastes Conference on Dec. 12 and 13. The conference is open to registered professional engineers and engineers-in-training in the sanitary engineering field. For information and registration blanks, write The Director, Center for Continuation Study, University of Minnesota, Minneapolis 14, Minn.

South Dakota Water & Sewage Conference

Registration for the 24th South Dakota Water and Sewage Conference, held at Deadwood on Sept.

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New, Transistorized M-Scope Pipe Finder

Here's what exclusive Fisher transistorized design means to you:

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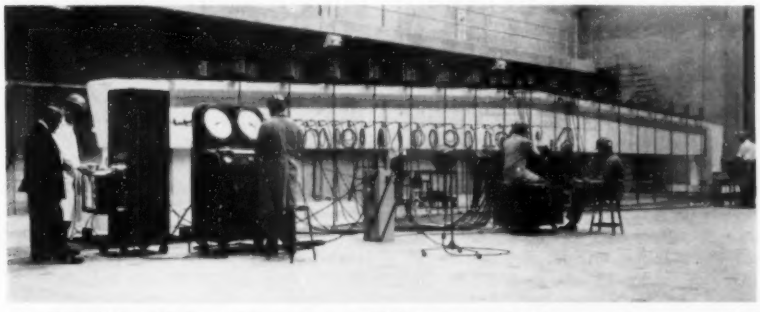
18-19 totalled 106. The opening paper by Dr. W. D. Hatfield, was followed by a panel discussion on water and sewage problems in recreational areas. This was presented by S. E. Carl, Thomas Boothroyd, Robert Arkins and Fred Brady. The afternoon session was devoted largely to public relations. Awards were presented at the annual banquet. Officers were elected as follows: President: Alfred Ross, Huron; Vice-President, Byron Fees, Chamberlain; Secretary-Treasurer, Don C. Kalda, Pierre; Directors: C. H. Tapping, Minneapolis; Willard Parlet, Winner; Joe Nigg, Sr., Ipswich; James A. Cox, Sioux Falls; Charles W. Fleming, New Underwood; and Emil Pfitzer, Mobridge.

NEW BUILDING IS CALLED "LARGEST TESTING MACHINE"

THE "WORLD'S largest testing machine" was publicly shown for the first time on Sept. 8, at the Research and Development Laboratories of the Portland Cement Association, near Chicago. The machine is actually a three-story Structural Laboratory, constructed above ground entirely of precast concrete building units which were tilted or lifted into place. The floor of the building, designed like a bridge, is pierced by a total of 690 holes. By using relatively simple apparatus in combination with the floor, technicians at the laboratory are able to conduct many tests that cannot be carried out anywhere else.



● **TESTING a 60-ft. girder in the new PCA Structural Laboratory. Stress is applied through steel rods which can be seen extending from cross pieces through floor.**

The building, part of a $3 million expansion of the Association's research and development facilities at Skokie, Ill., is expected to produce information having a far-reaching effect on design and construction of many types of concrete structures. It adds 22,400 sq. ft. to the 103,400 sq. ft. of research facilities already at the site. A second new laboratory, a Fire Research Center, will be placed in operation early in 1959, providing an additional 35,400 sq. ft. of test space.

The Structural Laboratory is unique primarily because of its testing floor. The top surface of the floor is 24 ins. thick, and is joined to an 18-in. basement floor by a series of 8½-ft. high walls. In cross section, it resembles a very large box-girder bridge. Actually, the floor is built much stronger than an ordinary bridge because it acts as a test frame for all the loads or forces applied to specimens in the Laboratory.

The top surface of the floor is pierced by holes every three feet along its 120-ft. length and 56-ft. width. In testing, steel rods are attached to the test beam or girder, and extended downward through the holes to connect with hydraulic jacks located in the basement. These jacks pull down on the rods, exerting the desired loads on the test structures above. The loads can be applied easily at any point, in any direction and on specimens of practically any size or shape.

● **HYDRAULIC jacks beneath floor exert load on steel rods seen above.**

In the building, a floor slab or roof shell can be subjected to local loads of as high as 30,000 lbs. per sq. ft. A slab the size of the entire testing floor could be subjected to a load of many thousands of lbs. per sq. ft. A 50-ft. long beam can be given a total load of some 2 million pounds—forces considerably in excess of those that actual structures are required to withstand.

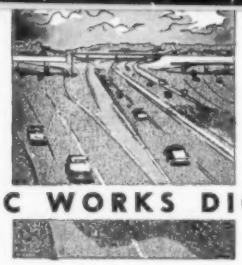
In fact, according to Dr. A. Allan Bates, the Association's vice-president for research and development, the floor is designed to handle every test for which the staff could imagine a future need, plus a little more. The new laboratory is already at work testing various types of structures and building units. Another project is aimed at development of better methods of connecting precast concrete units, such as factory-produced beams, wall panels, columns and girders. Prestressed concrete, a very rapidly growing type of concrete construction, will also be studied to extend its applications still further.

The entire laboratory above the first floor was assembled from precast units, erected by power equipment. These units were designed by the "ultimate strength design" method of engineering analysis. This method takes into account, more exactly than older methods, the inherent strengths of concrete and reinforcing steel, and makes possible the safe design of longer spans and higher buildings out of reinforced concrete.

• • •

Federal Highway Laws Codification Act

Congress has approved the bill (HR 12776) to codify and restate the Federal-aid and other highway laws into one act to be known as Title 23, U.S. Code, Highways. The legislation, which includes the 1958 Act, makes it possible for the first time to have available and easily accessible in one act all of the Federal laws pertaining to Federal-aid Highways. The law is arranged in 3 chapters: 1) Federal-Aid Highways; 2) Other Highways; and 3) General Provisions.



PUBLIC WORKS DIGESTS

Prepared by

FRANK FORCE

Associate Editor

THE HIGHWAY AND AIRPORT DIGEST

The Singing Median

On a 1½-mile section of the Amarillo - Canyon Expressway, where the highway divider median is restricted to a narrow width of 13 ft. in utilizing an existing section of pavement, the Texas Highway Department has incorporated a singing median along with the regular requirements of a highway divider median. The section of median is a 13-ft. wide by 3½-in. high corrugated surface concrete median with mountable sides. The singing, or roar, is the result of the wheels of the vehicle coming in contact with the corrugated surface. The corrugations were placed at a 15° angle with the perpendicular to the path of the median (a 15° right forward skew). The slant of the corrugations gives a slight returning action and this tends to return a vehicle to its regular driving lane. The contractor used a sliding metal form about 15 ft. long, pulled by a winch mounted on a truck, to lay the median. The form ran on a 2-in. by 6-in. oiled lumber which was laid flat and spiked into the existing asphalt surface. At the front of the form was a section to receive the concrete; and mounted with the receiving section were 2 mechanical vibrators to obtain necessary compaction. Corrugations were formed by a finisher using a long handle bull float with a corrugated pad in lieu of the standard smooth float pad.

"The Singing Median." By Lyndol B. Carter, Resident Engineer, District 4, Texas State Highway Dept. *Texas Highways*, September, 1958.

Competitive Bidding for Professional Work

There are three parties to any code of ethics; namely, the client, the engineer and the public. The interests of all three must be considered and competitive bidding is against the best interests of all three. The professional engineer should provide the best of his talents to each and every client and expect to be recompensed adequately for his services. The courts and the best in legal opinion have repeatedly held to the effect that engineering services are professional services and as such need not be procured by the process of competitive bidding. The American Society of Civil Engineers recommends that professional services be secured by negotiated contracts. This procedure can be found in the ASCE Manual of Professional Practice, Manual No. 29.

"Competitive Bidding for Professional Work Should Not Be Tolerated." By William G. Murphy, Associate Professor and Director, Dept. of Engineering Mechanics, Marquette University. PUBLIC WORKS, October, 1958.

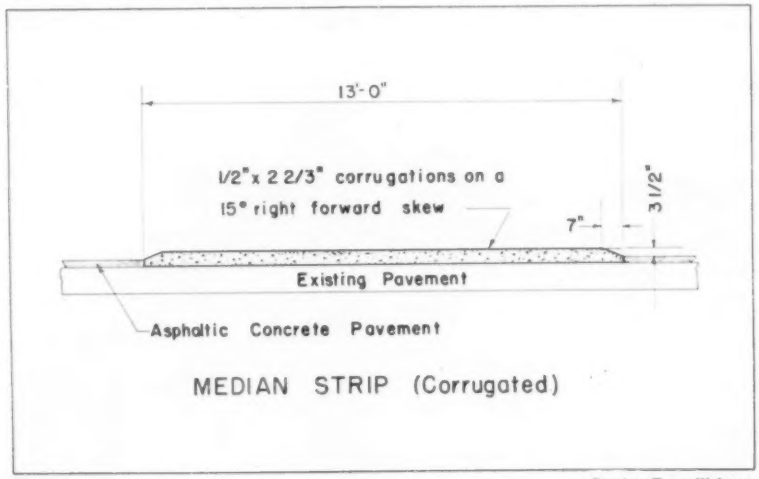
City Keeps Building Concrete Streets

Chisholm, Minn., has an area of 4.3 sq. mi., and some 39 miles of concrete streets. Over the years there has been considerable change in construction procedure of building concrete pavements brought about by new equipment and methods. Several improvements include the use of telescoping manhole rings; separately poured, roll-type street curbs; and sawed contraction joints. Paving widths are 25 ft. in the residential areas and 37 ft. for feeder streets. A uniform thickness of 6 ins. is used for all streets and specifications call for a 28-day concrete strength of 3,500 psi and air-entrained cement with 5 percent optimum air content. Equipment used by the contractor included a Chain Belt mixer; Jaeger screed and tamper finisher; Lakewood screed; Dotmar curb machine; and a Concut concrete saw. Transverse contraction joints were placed at 15-ft. intervals between the expansion joints formed with steel inserts. These were spaced at 60-ft. intervals. A pressure applicator was used to seal all joints with a rubber-asphalt compound.

"Chisholm, Minn., Keeps Building Concrete Streets." By Anthony Enrico, Building Inspector, Chisholm, Minn. *The American City*, September, 1958.

Shoulder Maintenance Practices

The highway shoulder's function is essentially that of safety to furnish an unobstructed space between the driving surface and the ditch or fill hazard, and to provide extra driving width when needed. Shoulders now being constructed by the Ohio Highway Department include stabilized, grassed, and penetration types, and maintenance efforts are directed to their preservation and



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1. To push back high berms of snow along ½ mile of access road to the Flathead County Hospital, Kalispell, Montana.

2. To clear 39,000 square feet of parking area around the hospital.

3. To 'doze up two berms of snow, each about 500 feet long, to serve as snow fences for the parking area and part of the road.

This Cat D4 Tractor with No. 4A Bulldozer is one of six Caterpillar-built machines in an equipment line-up used to maintain 2,900 miles of roads. When snows hit, the D4 is sent out on heavy-duty removal jobs. It is also used to maintain a sanitary landfill area and to work on road construction.

Because the D4 combines compactness and maneuverability with ample power, it is an ideal tractor for public ownership. Ruggedly built, it stays on the job with a minimum of maintenance and down time. For example, its oil clutch — an exclusive Caterpillar attachment — delivers up to 2,000 hours without adjustment. And its track shoes are hardened by a special process for longer wear than ordinary shoes.

Between snow removal, landfill and road construction, you can keep a D4 busy all year around. Your Caterpillar Dealer backs you with round-the-clock service and parts you can trust. Ask him to show you why, compared with other tractors in its power class, the Cat D4 Tractor is the best buy for your tax dollars. Call him today!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

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Rhode Island Brush Removal

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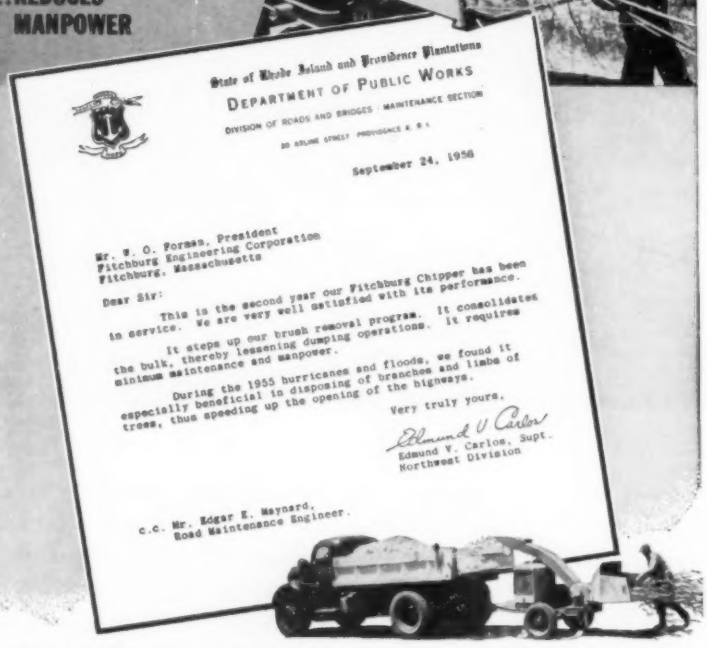
...LESSENS DUMPING OPERATIONS
...REQUIRES MINIMUM MAINTENANCE
...REDUCES MANPOWER



State of Rhode Island and Providence Plantations
DEPARTMENT OF PUBLIC WORKS
DIVISION OF ROADS AND BRIDGES - MAINTENANCE SECTION
80 ATLANTIC STREET, PROVIDENCE 4, R. I.

September 24, 1958

Mr. W. O. Forman, President
Fitchburg Engineering Corporation
Fitchburg, Massachusetts

Dear Sir:

This is the second year our Fitchburg Chipper has been in service. We are very well satisfied with its performance.

It steps up our brush removal program. It consolidates the bulk, thereby lessening dumping operations. It requires minimum maintenance and manpower.

During the 1955 hurricanes and floods, we found it especially beneficial in disposing of branches and limbs of trees, thus speeding up the opening of the highways.

Very truly yours,

Edmund V. Carlos

Edmund V. Carlos, Supt.
Northwest Division

c.c. Mr. Edgar E. Maynard,
Road Maintenance Engineer.

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betterment. Ohio has many miles of traffic bound shoulders and these are dragged or bladed as traffic dictates; and they should be reshaped after rains when moisture conditions permit. Material should be added as needed; top size should preferably not exceed ¾-in. as larger sizes are whipped off by fast traffic. Grass shoulders to be seeded should be built from 1 in. to 1½ ins. below the pavement edge; and shoulder material should contain proper combinations of aggregate and binder soil to furnish stability for an occasional vehicle load. Grassed shoulders should be maintained by patching out ruts and bad spots, leveling and compacting with light rollers as moisture conditions permit, and by normal mowing and routine clean ups. Shoulder surface treatments should be placed on a good base, and this type seals and waterproofs the pavement edge. Shoulder stabilization work consists normally of scarifying, pulverizing, incorporating chloride or cement and additional aggregate and water, mixing, compacting, reshaping and adjusting to the desired cross section, followed by application of a prime and seal coat. Maintenance of these types consists of routine base repairs and surface patching and spot sealing.

"Shoulder Maintenance Practices." By J. W. Reppel, Engineer of Maintenance, Ohio Dept. of Highways. PUBLIC WORKS, October, 1958.

Are There Two Ways to Use a Two-Way Radio System?

Marion County, Kans., did as many counties have done in the past: They first installed mobile radio units in their county vehicles and used the sheriff's central station. After more radios were installed in county highway equipment, the system became overcrowded. The commissioners approved money the first of this year for the purchase and installation of the highway department's own central radio station. The standard county highway signals are the "Eight Signals" and they are divided into six sections in order that the receiver or sender can identify the message more easily. The first 25 signals in the Standard 8 signals are general procedure signals and will occur frequently in most orders of business. The next 18 signals deal with administration and personnel. The next 9 messages apply to accident and traffic or law enforcement as applied to county highway work. The next 31 messages apply to county highway control work. Under emergency there

FANTASY YESTERDAY...
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The construction of roads and freeways that only yesterday were considered fantastic is now going full speed ahead. Thanks to asphalt this construction is easier, better and less costly. Comparative cost figures make it plain that in initial cost and in maintenance, asphalt saves millions on heavy-duty roads. And if you have driven on asphalt—and on anything else—that's all the argument you need in favor of asphalt for safer, more comfortable riding.

Sohio long ago established itself as one of the largest producers and sellers of asphalt in the nation. To maintain this reputation, two factors have been responsible—*consistent* top quality and Sohio's famous "round-the-clock" service that loads and delivers asphalt supply where and when it is needed *day or night*. To take advantage of this service, make Sohio *your* source of asphalt supply. Call or wire, Sohio, Asphalt Division, Midland Building, Cleveland 15, Ohio.

are 12 messages and the remaining 4 signals are reserved for personal favors. A county engineer is doing himself and his county a favor if he standardizes messages used on the two-way radio and hangs only clean linen on the short-wave line.

"Are There Two Ways to Use Two-Way Radio System?" By James F. Meisner, Marion County Engineer, Marion, Kans. *Better Roads*, September, 1958.

Street Reconstruction With Lime Stabilization

In striving for better low-cost streets and reduced maintenance costs, Austin, Tex., began using lime stabilization in reconstructing worn-out city streets. A 1700-ft. section of Lake Austin Blvd. was reconstructed with lime. After several laboratory tests were run on the existing base material, it was found that 3 percent lime reduced the P.I. four-fold; reduced the lineal shrinkage nearly fourfold; and generally reduced the soil binder content (passing 40 mesh). Standard stabilization construction procedures were used involving scarifying, spreading lime, mixing, compacting and asphalt surfacing. Considering a spreader width of 10 ft., one truck load of lime, which averaged 15 tons, covered the length of the project. Immediately after the base was finished, it was protected from rapid drying by application of emulsified asphalt diluted with water and spread in three applications (the total residue of emulsified asphalt was 0.1 gal. per sq. yd.). Following a curing period of one week, the road was surfaced with a double asphaltic treatment. The bid price was 48¢ per sq. yd. for the lime stabilization (including cost of lime and manipulation of base) and 20¢ per sq. yd. for the prime coat and double asphaltic surface treatment.

"Low Cost Street Reconstruction With Lime Stabilization." By Arnold R. Kelley, Construction Engineer, City of Austin, Tex. PUBLIC WORKS, October, 1958.

Maintaining an Expanding Street System

Maintenance of paved streets in Kansas City, Mo., is a problem due to the age of the pavements and the constantly increasing traffic volume. Realizing the necessity for a planned program of consistent street maintenance and repair, the City Council authorized the present city gasoline tax of 2¢ per gallon to be used and augmented these funds with a $2.5 million rotating bond program. Street resurfacing and major repair are handled by independent contractors with the Engineering Division providing the engineering and inspection services. Each fall engineers make an inspection of all paved streets and determine the group of streets to be paved next. The contractor first removes and replaces all failed sections of the existing pavement and base and removes all failed spots and bleeding asphalt patches. The prime coat used is either a light MC or an emulsified asphalt. On the trafficways the wedge course is put down with a paving machine; on the residential streets, with a motor grader. A pneumatic type roller is required on all courses in addition to the flat wheel rollers. In sealing, all cracks in the pavement surface, wider than ¼-in., are brushed clean, filled with limestone chips and then filled with asphalt which has been treated with an anti-stripping agent. Street patching is handled by the Street Repair Section of the Division of Streets. Five hot asphalt crews are busy patching pavements and restoring utility cuts. Maintaining dirt streets keep four crews busy the year around patching holes. Cold mix is used and it is bladed with city equipment; and a portable five-

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digs 12½ ft. deep in any position of 190 continuous swing

NEW! A-FRAME DESIGN insures a solid foundation for smooth performance even when the going is rough! Levels up to 10° on hillsides. ANGLE-POISED OUTRIGGERS give rigid bracing for digging and loading at any angle up to 95° right or left from the centerline of tractor!

NEW! 7000 POUNDS OF "BIG MUSCLE" POWER at point-of-bite moves more yardage, faster!

NEW! BUILT-IN DEPENDABILITY results from reverse-mounted bucket and crowd cylinders which place the highly polished rods up and away from rocks and dirt and do away with exposed hydraulic lines and hoses. The "big muscle" doesn't know what "down time" is!

Completely maneuverable, the Ottawa Model LX MOUNTS ON MANY TRACTORS . . . digs 12½ feet deep in any position of 190° continuous swing . . . features exclusive "One Trols," automatic dirt-ejector buckets . . . turret-type seat that pivots with boom.

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You can salt-treat your pavements **8 times Faster** and **50% Cheaper** with a stainless steel "Scotchman". Choice of 3 models to use on any dump truck or pick-up . . . no complicated hook-ups. One man Cab Control is optional. EXCLUSIVE features: 1. **Cartridge-type Power Unit** . . . engine, impeller and electric starter in a single, compact unit —removed or installed in 5 minutes; 2. **Accurate Controls** . . . of rate of spread, of direction and width of spread; 3. **Stainless Steel** . . . all sheet metal touched by salt. For details and demonstration see your "Scotchman" dealer or write to us.

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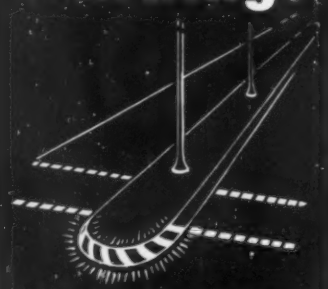

Highway accidents are taking a ghastly toll of maimed and dead. Reflective glass bead installations of Flex-O-Lite Type H Safety Spheres clearly define traffic hazards—work effectively day and night in the cause of safety. Flex-O-Lite Type H Safety Spheres get their warnings across quickly with powerful impact. For low first cost—low upkeep—fully effective protection—specify Type H Safety Spheres by Flex-O-Lite. Write for details.

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ton rubber tired roller is used for compaction.

"Maintaining an Expanding Street System." By Ray Blessing, Commissioner of Streets, Kansas City, Mo. *Street Engineering*, September, 1958.

How Ohio Establishes Turf on Roadside Areas

Roadsides have an important part in highway construction with the wide rights-of-way of future highways and the many inter-related factors to be considered. In Ohio, the selection of grass seed, fertilizers and mulches that are best suited to the area, soil, exposure and climatic conditions is of great importance, but of equal worth is the preparation of the seed bed, keeping the mulch in place, and the other operations vital to good results. A good turf must survive droughts, be maintained by herbicides or inhibitors and be closely knit to reduce weed infestation and reduce maintenance costs. The seed mixture used calls for 70 percent Kentucky 31 fescue, 20 percent Kentucky bluegrass, 5 percent red top and 5 percent clover. This is sown at the rate of 3 lb. per 1,000 sq. ft. A 10-10-10 or 12-12-12 (pelleted) analysis fertilizer is most frequently used at the rate of 900 lb. per acre. Lime is used only when soil tests show a need for it. The seed is covered to a depth of ½ in. and mulch 2 ins. thick is applied over all seeded areas, tied down at once and kept in place. Mulching may be done by tying down the vegetative mulch mat with a string, by using a power-driven rotary type of mixing machine, by using an asphalt emulsion to tie down the mat or by using an asphalt applied to the seeded area at the rate of 0.2 gal. psy. The state reserves the right to test, reject or approve all seed after delivery on the project. The two most common pieces of equipment used on seeding projects are a hydraulic seeder and a mulch blower.

"How Ohio Establishes Turf on Roadside Areas." By Wilbur J. Garmhausen, Chief Landscape Architect, Ohio Dept. of Highways. *Better Roads*, September, 1958.

Current Structural Bridge Steels

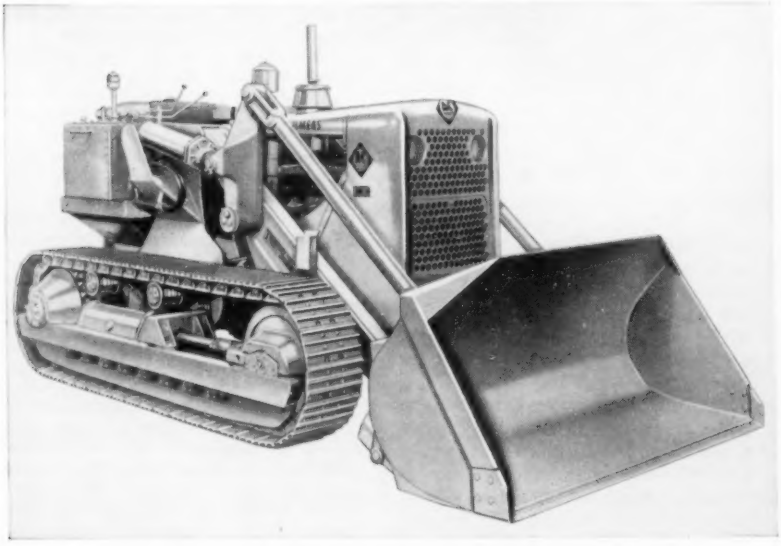
The advent of welding for steel bridges, and a demand for higher strength steels for large structures and those requiring higher working stresses, gave rise, a couple of decades ago, to a number of continuing research studies covering the characteristics of structural steels and

For Top Tractor Shovel Performance Try Allis-Chalmers—the Look-Ahead Line

The superior operating ease and economy of Allis-Chalmers tractor shovels make them ideal for street and road work, loading and stockpiling bulk materials, sanitary landfill and general excavating work. These powerful units are available in four sizes with bucket capacities up to 7 cu yd to fit every material handling and earth-moving job.

A broad line of interchangeable attachments includes light materials buckets, rock buckets, lift forks and rippers — to further extend the usefulness and adaptability of the units.

Your Allis-Chalmers construction machinery dealer will demonstrate the machine of your choice . . . on your job . . . no obligation. Call him today to arrange the date.



Talk about versatility, this HD-11G is available with your choice of 13 different front-end attachments to match a multitude of jobs. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

Wide Range of Sizes Matches Various Materials, Conditions

HD-6G
1½ cu yd
72 net engine hp
19,600 lb

HD-11G
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111 net engine hp
32,000 lb

HD-16G
3 cu yd
150 net engine hp
(torque converter drive)
47,800 lb

HD-21G
4 cu yd
225 net engine hp
(torque converter drive)
66,500 lb

Look ahead... *move ahead* ...and stay ahead with **ALLIS-CHALMERS**

Dodson's Digest

About a doubt

One of my customers – Gil Fryer, who is a county highway engineer – is always making tests to compare the merits of the various products he recommends for road maintenance. Long a booster of Calcium Chloride for ice control, Gil even made a test on that . . . as I discovered when I called on him recently.

"Hey, Dod!" he had yelled angrily, before I'd had a chance to say hello. "You know how you always said that Calcium Chloride would melt ice over 30 times as fast as salt? How it's effective right down to 59° below? How it anchors itself in? And—"

"Yes, and how it keeps abrasive piles loose in any temperature!" I broke in. "How it won't leave any residue on pavement, floors, or equipment. Sure, what about it?"

"Well," Gil growled, "my tests last night prove that it melts ice like you said. But how do you account for that slick patch where I put it next to our storage shed over there?"

"You mean you were out in that freak ice storm?" I gasped. "Why that pulled the power lines down all around here. How did you see?"

"Finished up in the dark," he flung back. "Had to feel for the last few bags of Calcium Chloride I applied. But the results showed up this morning. In fact, my supply is gone. Rushed the super out early for an emergency order."

Just then the superintendent's pickup truck came screeching into the yard. Slamming to a stop near the storage shed, it touched the patch of ice, spun dizzily around, and caromed into the frame building with a fender-shattering crash.

Running breathlessly over, we could hear a dazed voice coming from the cab. "It's that Gil and his crazy tests," it groaned. "He scattered my last six bags of sheep manure in this flooded stretch of drive last night and it must have froze solid!" — L. D. Dodson

P.S. — To ensure fewer accidents during the coming months, send for our free booklet, "Melt or Skidproof Icy Surfaces with Wyandotte Calcium Chloride." Just drop me a line. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

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HEADQUARTERS FOR CALCIUM CHLORIDE

leading to the promulgation of new specifications and the revision of others. This article summarizes and compares the characteristics of the common bridge steels available in this country and attempts to answer the more frequent questions concerning their use. Standard bridge steels are made by the leading steel producers that roll plates, shapes and bars. The characteristics of end products are governed by the applicable standard specifications of ASTM or by proprietary specifications. During the past quarter century, welding has been increasing progressively as a means of fabrication, and since the mid-century the tempo of this program has been intensified. Therefore, welding is not ignored in this survey.

"Current Structural Bridge Steels: A Survey of Usage and Economy." By Nathan W. Morgan, Bridge Engineer, Bridge Div., Bureau of Public Roads. *Public Roads*, October, 1958.

Snow and Ice Control in Large Urban Areas

In a climate such as Philadelphia's it is problematical from winter to winter what amount of snowfall is to be expected. Hence, the purchase of equipment usable only in snow removal or plowing must be examined carefully so as not to expend the tax dollar with none or very little return for several years. For the 1957-58 winter, the cost of snow and ice control amounted to $800,000. To provide access to homes on small or narrow streets with vehicles parked on both sides, crawler tractors are used to compact the snow. There is approximately 5,000 tons of salt used annually in ice control. Abrasives are used on steep grades and on other streets when the temperature falls to a point where the rock salt becomes practically ineffective. The city uses the following equipment in its snow removal program: 120 blade plows; 13 mechanical brooms; 50 trucks; 15 front-end loaders; 7 motor graders; 13 abrasive spreaders; 40 salt spreaders; 12 tractor plows; 6 bulldozers; 4 winch trucks; and 10 tow trucks. Mechanical brooms are used to remove snow up to a depth of 3 ins. in the central city area. The brooms pick up the snow until the hoppers are full, and then move to a designated dumping site where the snow is loaded into trucks by front-end loaders. For deep snow, the conventional bucket-type snow loaders are used, accompanied by trucks and tractor plows. The Sanitation Division and the Highway Division can muster a total personnel of 3,000 for work in snow and other emergencies.

"Snow and Ice Control in Large Urban Areas." By John L. Keenan, Assistant Chief Engineer - Maintenance, Dept. of Streets, Philadelphia, Pa. *Street Engineering*, September, 1958.

Other Articles

"**Salt-Soil Stabilization** on Township Roads." The growing township with a limited budget turns to salt stabilization in road building. By William A. Sommers, Bensalem Township Manager, Cornwells Heights, Pa. Public Works, October, 1958.

"Removal, Trimming and Planting of **Roadside Trees.**" This maintenance program is a balanced one, which will provide safety for the motorist, with pleasing roadsides, and yet preserve the trees and much of the natural vegetation and ground cover. By W. J. Burmeister, Engineer of Maintenance, State Highway Commission of Wisconsin. Public Works, October, 1958.

"Joint Action Assures **Effective Snow Removal.**" Advance planning and availability of equipment results in orderly procedure and minimum delay in Rock Island, Ill. By Earl T. Miller, Supt. of Public Works, Rock Island, Ill. The American City, September, 1958.

"Vibration of **Sand Cuts Foundation Costs** 20%." By Edward H. Wells, Chief Engineer, Sargent-Webster-Crenshaw-Folley, Syracuse, N. Y. Engineering News-Record, August 28, 1958.

"**Photogrammetry**—A Few Questions Answered." By employing a scale model, photogrammetry makes it possible to do the map compilation in the office without regard to weather or other outside conditions, and the project can be divided up among a large number of workers. By Ray A. Kelsey, Chief Engineer, Kargl Company, Inc., San Antonio, Tex. Civil Engineering, September, 1958.

"**Lime Stabilization** Methods and Experience at Fort Polk, La." Details of design and construction for a program based on successful local experience with lime as an economical stabilizing material. By Charles G. Van Dine, Chief, Roads and Grounds Division, Fort Polk. Roads and Streets, September, 1958.

"**Snow Removal.**" Motor grader units prove worth during past winter. By A. C. Dildine, Senior Equipment Engineer. California Highways and Public Works, July-August, 1958.

"Construction of **Continuously Reinforced Concrete Pavement** at Dundee." By M. H. Waller. The Surveyor, August 23, 1958.

"**Radio Control For Traffic Signals** in Wayne County, Michigan." By Joseph W. Gross, County Highway Engineer, Wayne County Road Commission, Detroit, Mich. Street Engineering, September, 1958.

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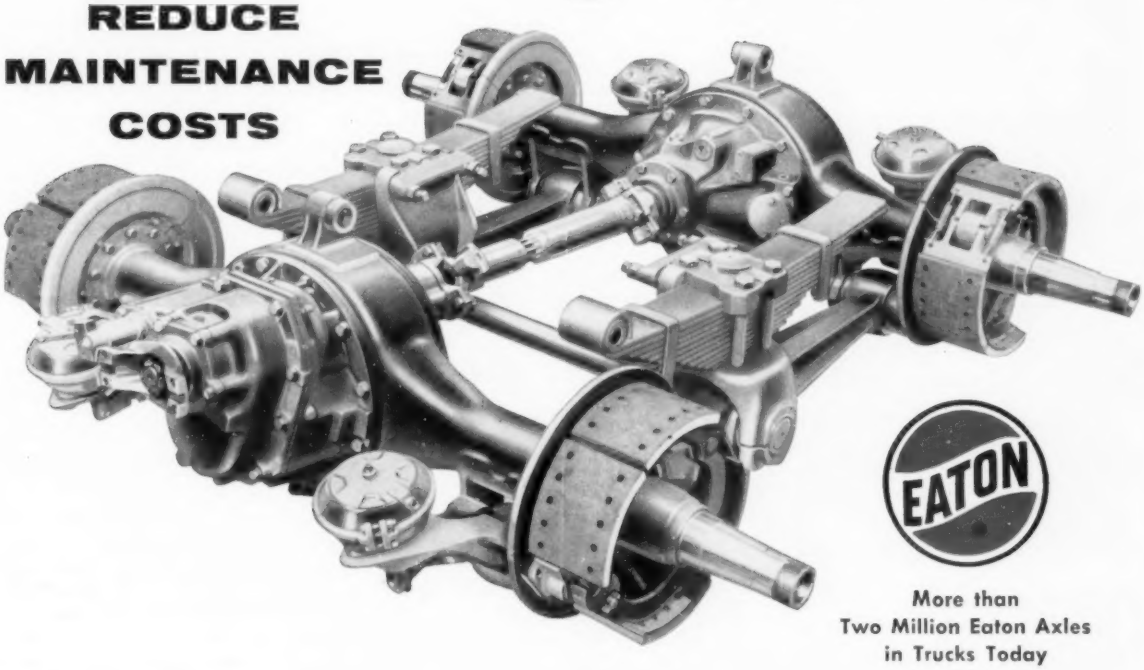

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EATON TANDEMS effect important savings in overall length and gross vehicle weight—permit the hauling of maximum legal payload. While saving some 400 pounds of weight (in the 38 Series), Eaton has actually achieved *greater strength* through improved design and metallurgy and the use of Eaton Inductalloy Axle Shafts.

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Although announced only six months ago, the outstanding performance and dependability of these new Eaton Tandems have been proved conclusively, both in the testing laboratory and when subjected to the severe conditions of heavy-duty hauling. They are available with single reduction, two-speed, or planetary double reduction axles, in a wide range of gear ratios. Ask your truck dealer for complete information.

- ★ Save more than five inches in OAL*
- ★ Save 400 pounds of GVW*
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*38 Series

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BEST OPERATED
Sewage Treatment Plant in Florida

HARRY L. BERKSTRESSER,
Director of Public Utilities,
Panama City, Florida

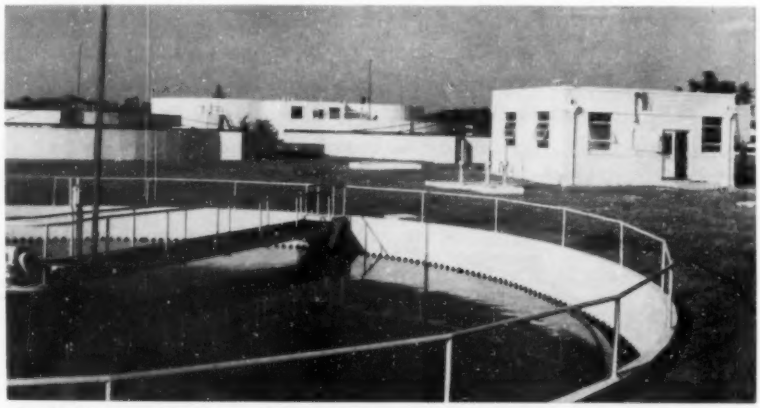
IN WINNING the recent award by the State Department of Health for the best operated sewage treatment plant of any class in the State of Florida, particular emphasis was placed on the quality of the effluent. The raw sewage BOD averages 250 mg/L at the diversion box entrance to the plant. After treatment the effluent averages 10 mg/L BOD. These results reflect both the excellent design of the plant and the care and skill of the operators; and to achieve the standard of operation necessary to win an award, the superintendent must have the initiative and energy to establish a high degree of teamwork with the operators and employees who are essential to the final result.

The Panama City sewage treatment plant was designed by Smith & Gillespie, Consulting Engineers of Jacksonville. It was built by the Boyce Construction Co. of Clearwater. The plant is of 3 mgd capacity and utilizes Dorr-Oliver clarifiers and distributors for the trickling filters. There are two primary and two secondary clarifiers and two trickling filters. The plant is located on an island in a very large bayou and is approached by a causeway connection to the mainland. The bayou is used extensively for water skiing and participants approach the plant outfall frequently since the effluent is very clear and practically unnoticeable.

The aim and objective of most directors of sewage treatment is to produce an effluent that will meet the standards established to protect the health of the community. Winning an award is always an incentive for anyone who has even a bit of romance in his work to call his team together and plan what can be done to improve operation even further.

Essential in such a program is keeping records that will truly indicate the quality of the plant's performance and will permit the submission of reports to the state covering essential data. These are also an excellent protection against possible complaints and provide guidance for betterments in operation or needs for new facilities.

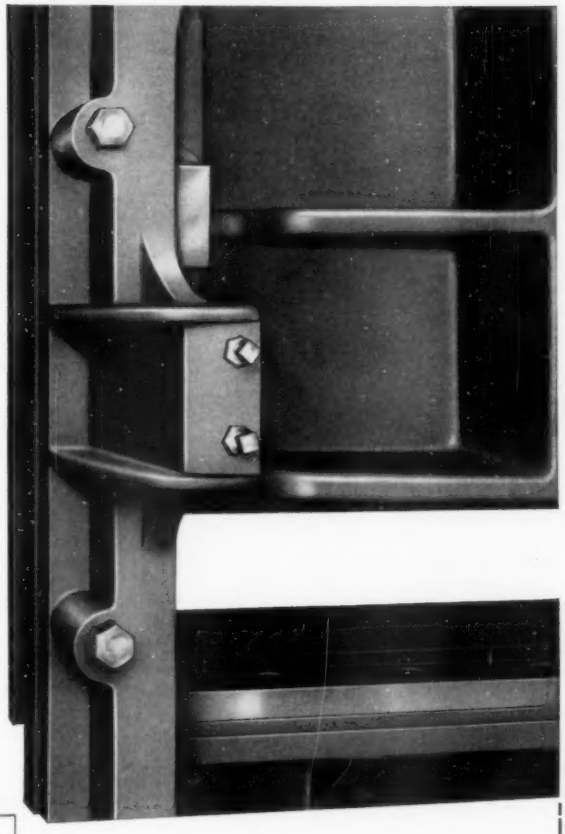
High on the list also is the constant vigilance necessary to keep the plant and grounds neat and clean, and attractive in appearance. Public relations are likewise important and we have enjoyed having numerous grade, high school and junior college groups visit the plant. Likewise we have missed no opportunity to talk to student groups in their classrooms, telling them of the importance of the plant and of the principles on which it operates. As a result of these and other public relation activities, we are able to keep the community interested in the plant and aware of the values it contributes.



● **GOOD housekeeping and first class operation are reflected in this picture of the Panama City sewage treatment plant shown in full in the air view at top of page.**

Armco Gates with flush bottom openings give you increased capacity, flushing action, uninterrupted flow

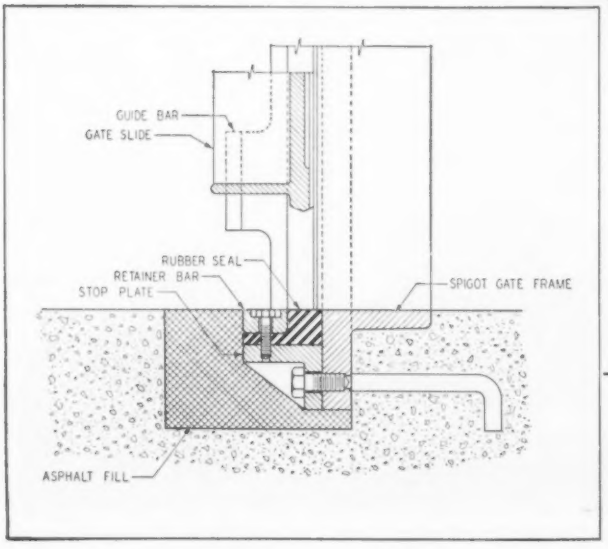
Close-up view of Armco flush bottom opening.



Flush bottom openings in various Armco Gates provide a continuous flat bottom channel across the bottom of the gate opening. There are no protrusions to interfere with flow or to catch debris and solids when the gate is open. Since only the top surface of the rubber seal is exposed, these openings are equally efficient for flow or operating heads in either direction. You can get the flush bottom opening on all sizes of Armco Series 35-05, 55-10, 55-20, and 100-30 Gates (more than 200 different gates).

Armco Gates are also available with standard perimeter seating. Sizes range from 6-inch square or circular openings to 108 inches. They are available for face heads up to 100 feet, back heads up to 30 feet.

Send coupon for folder, "Armco Gates for efficient, trouble-free water and sewage control." Armco Drainage & Metal Products, Inc., 3058 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.



Armco Drainage & Metal Products, Inc.,
3058 Curtis Street, Middletown, Ohio

Send me the folder, "Armco Gates for efficient, trouble-free water and sewage control." I am interested in Armco Gates for the following uses

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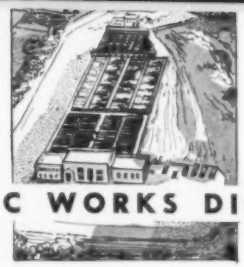
City _____ Zone ___ State _____

ARMCO GATES



PUBLIC WORKS DIGESTS

Prepared by

ALVIN R. JACOBSON, Ph.D.
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE SEWERAGE AND REFUSE DIGEST

Privately Owned Sewage Works

In August, 1956, the first privately owned and operated sewage treatment plant in the State of Ohio was placed in operation. This plant is at present serving a housing development of 1600 homes in the Dayton area. Before construction was started it was necessary to get approval for the project from county officials, the Ohio State Department of Health, the Federal Housing Administration and the public utilities commission of Ohio. A utility company had to be formed and approximately $1,000,000 had to be invested in the utility company before the first house could be occupied. Interim financing was obtained from a local bank, since long-range financing could not be obtained until the utility company was making a profit. To insure an efficient operation, an accounting firm was employed to set up accounting and office procedures. Sewage tariffs were prepared by the officers of the company and filed with the public utilities commission. The plant was designed to give complete treatment to the sewage from 1,600 homes, with 3.8 people per house, and an average daily per capita flow of 115 gallons and 0.17 pound per capita per day of 5-day BOD. The treatment process units include grit removal, comminution, primary sedimentation, trickling filters, recirculation chamber, final sedimentation, post chlorination and provisions for sludge digestion. The sewage flows by gravity to the sewage treatment plant and the treated effluent is discharged into the Miami River. The installation handling the sewage from this 1,600 home privately owned housing development represents an investment of $750,000.

"Private Utility Builds $750,000 Sewage Works for New Subdivision." By Lee Nozor and J. D. W. Henmeyer. *Wastes Engineering*, September, 1958.

Refuse Service Modernized

West Hartford, Conn., completed last fall the construction of a 350 ton incinerator consisting of two 175-ton Nichols Monohearth units. These units have an 18-foot 7 inch outside diameter necessitating the inclusion of the new Nichols Hydraulic Grate operating mechanism in their design. The dumping floor is completely enclosed and the area under the truck dumping platform is utilized as a garage for the storage and repair of collection vehicles. Four trucks can unload simultaneously into the storage pit which is 60 ft. long, 20 ft. wide and 20 ft. deep. A single 4-ton capacity P&H crane with 2½-cubic yard Blaw-Knox bucket transfers refuse from the storage pit to the furnace hoppers. Supporting equipment and facilities include water quenching ash hoppers, forced draft fans and electrical controls plus indicating pyrometers and pointer draft gauges. Dry baffle walls and extraordinarily large expansion chambers provide fly ash control. In June of this year the city took over collection of all refuse. This is accomplished with a work force of 43 men, 3 pickup trucks, one open dump truck and 10 closed units. The latter include five 20-yard Pak-Mors, four 18-yard Gar Woods and one 20-yard City Tank Corp. Roto-Pac, all on International chassis.

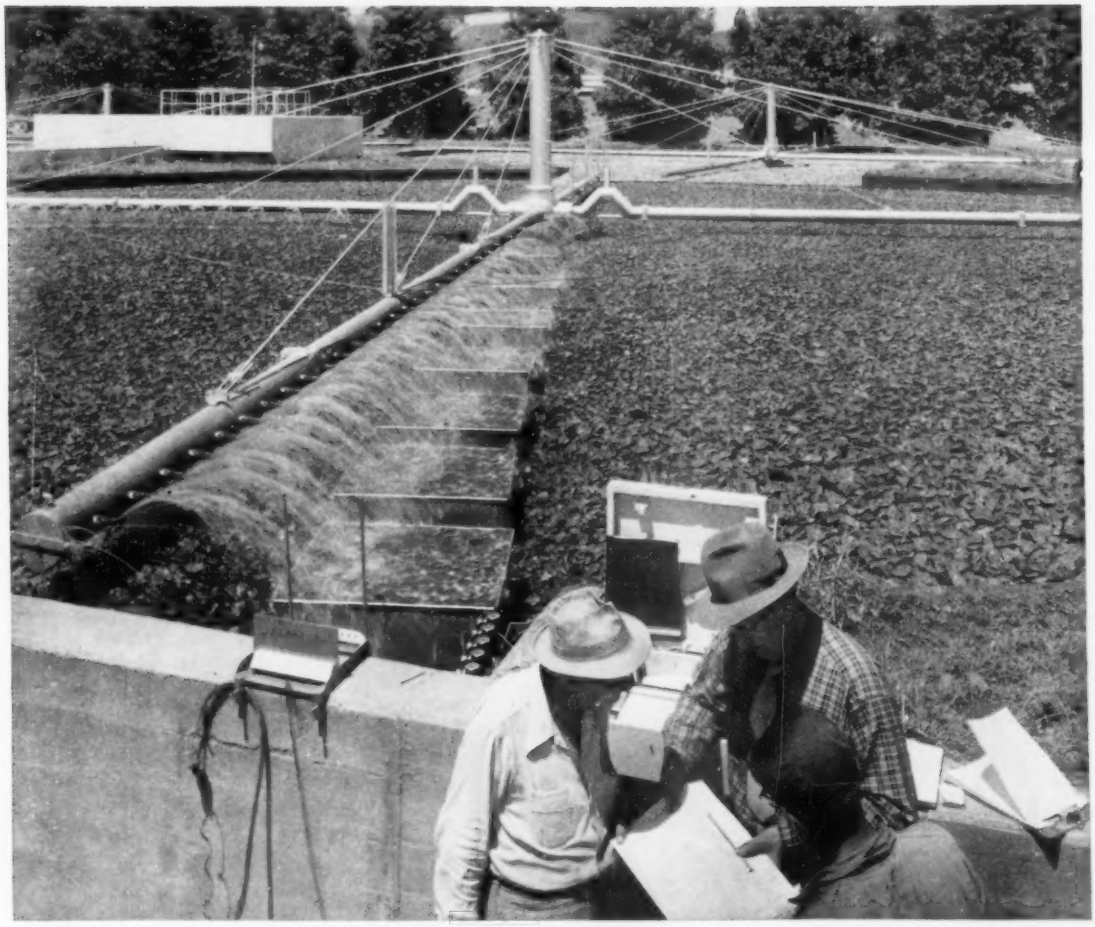
"West Hartford, Conn. Modernizes Refuse Service." Everett R. Kennedy. *The American City*, September, 1958.

Underground Pumping Station

An underground sewage pumping station was constructed at the Garden State Plaza shopping center in Paramus, N. J. to pump all sanitary sewage to a package-type sewage treatment plant for complete treatment. This station effectively solved the twin problems of a conspicuous site and poor foundation conditions. However, one of the design problems encountered was that little or no information was available on sewage flows to be expected from a shopping development of this size. Most other large shopping centers discharge sewage to existing systems, and sewage flow measurements were not available. Water consumption records were obtained from several shopping centers, however, and these data were studied to determine probable sewage flows. It was determined that the pumping station should be designed for an

Courtesy Truck Equipment Co.

● **MODERN incinerator for West Hartford, Conn., has two 175-ton Nichols furnaces.**



Pan Tests being conducted on one of the 113' P.F.T. Distributors at Greenville, S.C. These tests show high uniformity of distribution over the entire range of flows—from 400 to 2100 gpm.

Proven uniformity of distribution with P.F.T. Rotary Distributors

Ten new P.F.T. Rotary Distributors have recently been installed in the Greenville, S.C. sewage disposal plant to increase the capacity of the existing filters. Six are 113 foot units and four are 136 feet in diameter.

All ten Distributors are equipped with P.F.T. automatic low-loss overflows on the two secondary arms. These overflows permit two arm-four arm operation and assure uniform distribution over the wide ranges of flow with a minimum of head.

These P.F.T. Distributors, with proven uniformity of distribution, are the heart of Greenville's expanded new treatment plant.

Plant addition by Wiedman and Singleton, Consulting Engineers, Atlanta.

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initial mean annual flow of 50 gpm, average daytime rate of 100 gpm, and a peak rate of 240 gpm. The ultimate flows expected will be about twice these values when the entire center is completed. Four pumps having capacities of 80, 175, 265, and 375 gpm were selected to handle the expected sewage flows and have been found adequate to serve the ultimate development of the center. The pumping station was designed in the form of a circular caisson which when completed was divided vertically into two compartments with separate hatches and stairways. One side contains the wet well and above that the comminutor room. The other side consists of the pump room with the motor room above. The pumps used are vertical, dry-pit, non-clog sewage pumps.

"Underground Sewage Pumping Station Solves Difficult Site Problems." By C. Richard Walter. PUBLIC WORKS, October, 1958.

Construction of Sewers

The author presents an excellent discussion of the basic concepts of good sewer construction to prevent excessive infiltration and to minimize subsequent maintenance costs. The consequences of poor construction are cave-ins and root growth entering the sewer. Many of the newer specifications for sewers contain provision for infiltration tests of completed lines in order to encourage good workmanship on the part of the contractor. The author stresses the importance of good house sewers as at least 2/3 of the total length of the sewers in a community are these private sewers. Changing economic conditions are having a pronounced influence on present-day sewer construction methods. Contractors are devising means of reducing costs by cutting corners, reducing man hours per unit of construction, by mechanization, etc. The importance of planning is emphasized in order that progress can be made in an orderly fashion. Adequate consideration should be given to proper alignment, grade, bedding, jointing, manholes and backfilling. In addition, the importance of keeping adequate records of underground utilities is emphasized. A number of diagrams illustrate the basic points discussed in this article.

"Construction of Sewers." By L. K. Crawford. *Wat & Sewage Works*, September, 1958.

Sedimentation Efficiency

This paper is a discussion of the results of theoretical and experimental investigations conducted by the authors in 1953 and 1954 on the flow patterns in settling basins. The studies were divided into: a) investigations of the tracer measuring method and b) investigations to determine the hydraulic efficiencies of different types of settling basins. The "flow wave" method using a tracer, such as, an aqueous solution of salts, dyes, or radioactive materials is well known. In the authors' use the different tracers showed different characteristics, but it was observed that even with identical flow conditions and tracers the flow waves had different forms, caused by the varied dosing periods of the tracers. Where hurried dosage was involved, it was not possible to determine accurately the true time of dosage at the basin inlet. To standardize the tracer method, the authors have devised and proposed a new method of tracer measuring, called "Determination of Flow Diagram." In this procedure the tracer is dosed into the basin inlet over a longer period of time, but with the same intensity. The concentration of tracer in samples taken at regular

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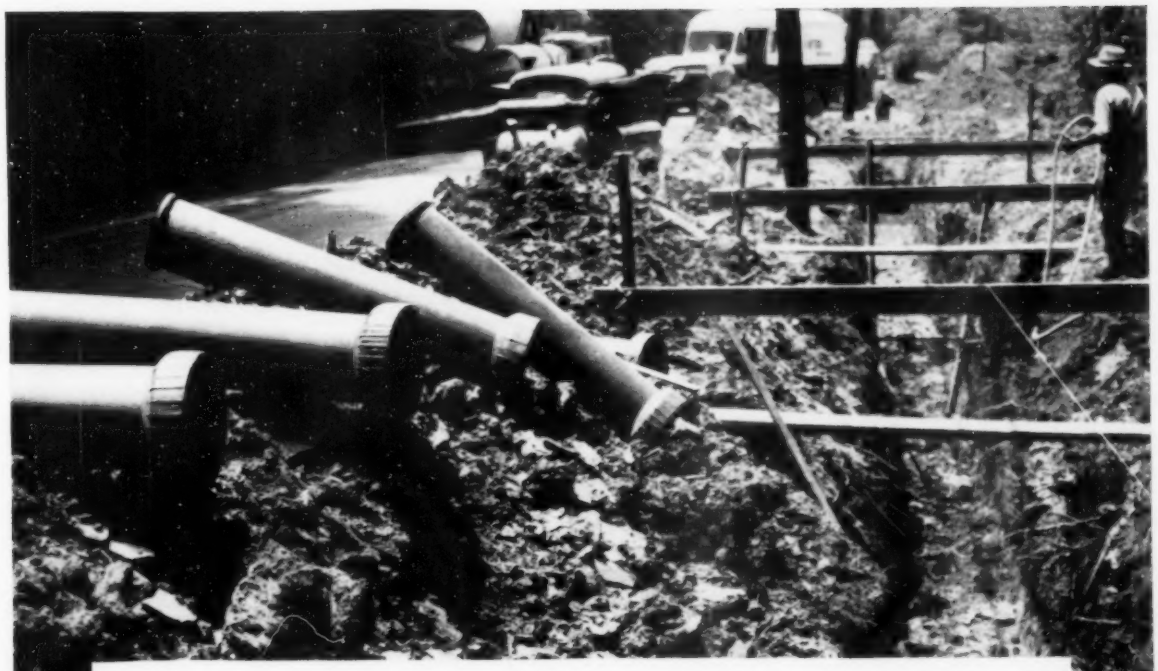

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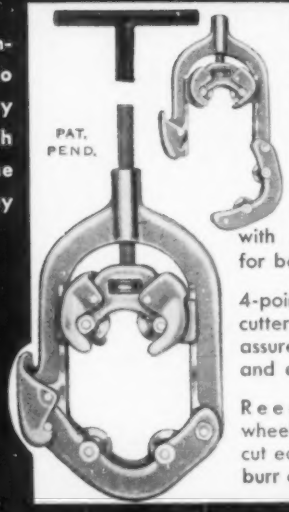

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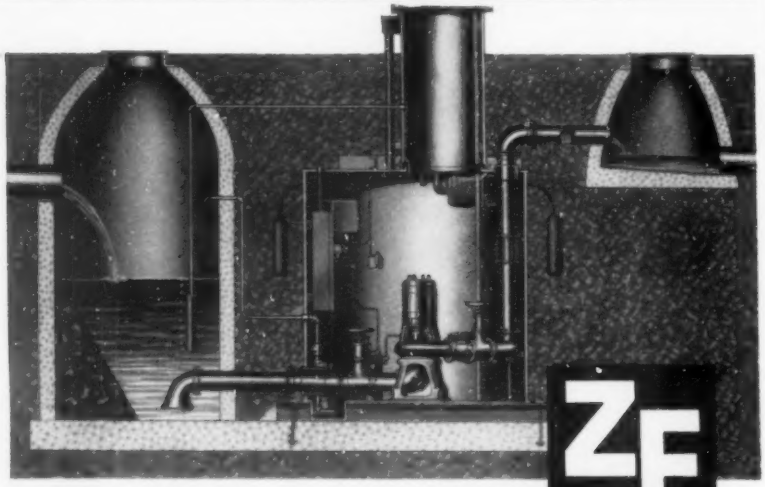

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intervals from the outlet of the basin varies with time and increases to a constant value.

The constant concentration determined at the outlet is established at the inlet after dosing by the tracer. The experiments reported here confirmed the belief that the increasing part of the flow diagrams is fixed, the amount of the dosed tracers having no influence on it. Some of the possibilities of using the flow diagram for the purpose of determining true hydraulic characteristics of settling basins are described in this article. Results of measurements on several sedimentation basins of various shapes and sizes are also given.

"Modification of the Tracer Measuring Method in Settling Basins." By L. Muszkalay and I. Vágás. *Sewage and Industrial Wastes*, September, 1958.

Other Articles

"Choosing the Right Incinerator." The author discusses the main factors to be considered in **choosing the right incinerator** for a particular community, the advantages and disadvantages of each of the four types of furnaces in the storage-pit and crane incinerators, as well as their relative costs. By Frank L. Heaney. Civil Engineering, September, 1958.

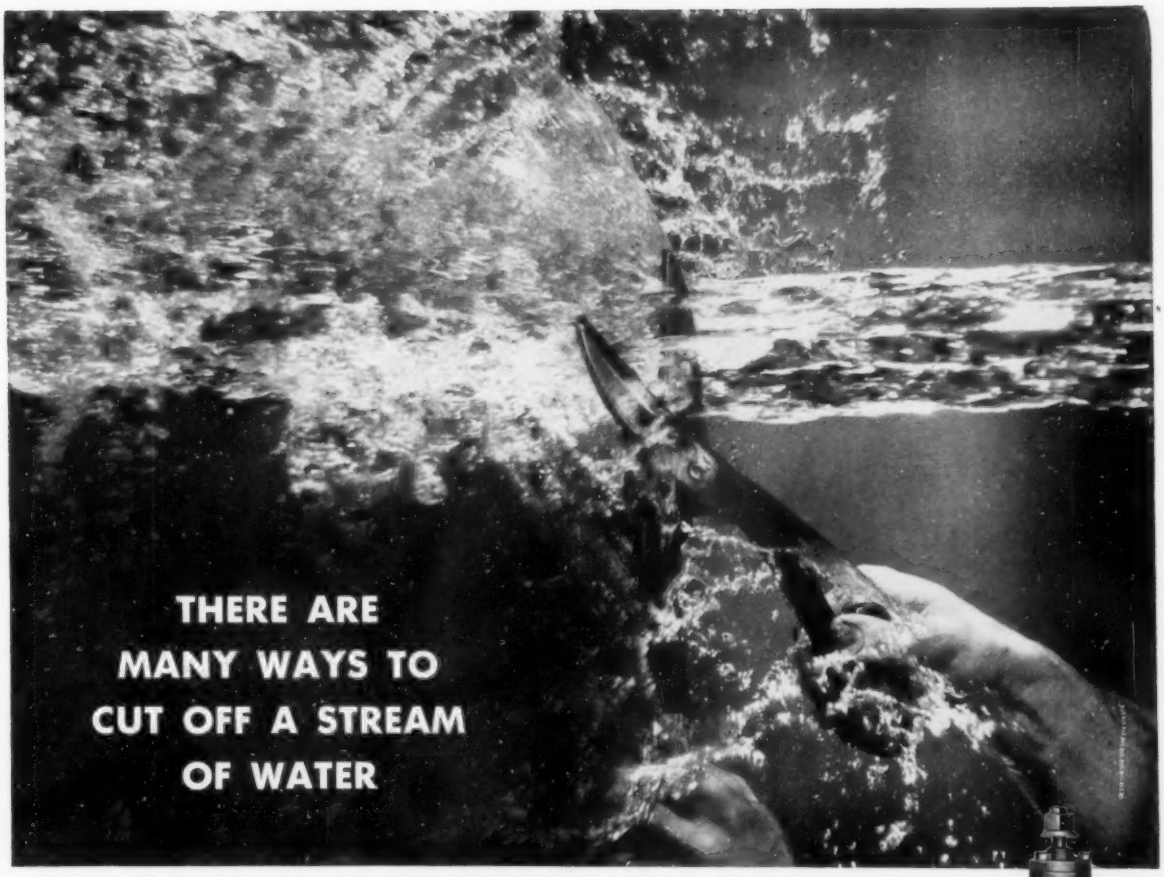
"General Design for High Rate Filters." This article discusses some of the factors to be considered and the probable results to be expected from **high rate filters** designed according to formulas which have been developed. Public Works, October, 1958.

"Unusual Pump Reduces Maintenance at California Sewage Treatment Plant." This article describes the successful use of three Moyno "progressing cavity" units for **pumping sludge** which had previously been proven successful in the process industry handling such nonpourable materials as putty, glue and caramel. By Elmer E. Ross. The American City, September, 1958.

"Transformation of Some Lipids in Anaerobic Sludge Digestion." This paper is a discussion of some experimental results on the **transformation of higher fatty acids during the digestion** of sewage sludge. By H. Heukelekian and Peter Mueller. S & IWA., September, 1958.

"An Effect of Biological Imbalance in Streams." This discussion describes attempts to solve a **Sphaerotilus natans infestation** downstream from a rayon plant at Jesup, Ga. By William A. Cawley. S & IWA., September, 1958.

"Sludge Filtration and Use of Synthetic Organic Coagulants at Hyperion." Production **use of synthetic polymer coagulants** over a 2½-year period has resulted in 25 percent coagulant cost saving. Filtration problems and coagulant tests are described. By R. D. Bargman, William F. Gerber and Joe Nagano. Sewage and Industrial Wastes, September, 1958.



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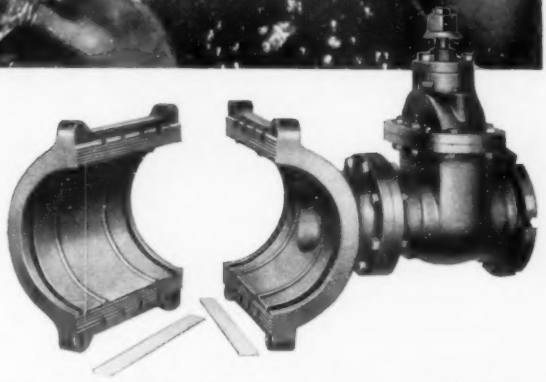

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● **GAUGES indicate flow from well located under the station, line pressure and pumping conditions. If power fails, this pump will be the prime source of water.**

DIESEL POWER CUTS WATER PUMPING COSTS

LeROY EBRIGHT,
Superintendent,
Westbury Water District,
Long Island, New York

FREEDOM from perennial hurricane-caused power failures and avoidance of high electrical demand charges have been achieved by combining diesel and electric power in the newest pumping station of Westbury Water District, Long Island, N. Y. Electrical demand charges only, for high capacity electric motors, would exceed within 15 years the cost of installing and operating the diesel engines.

Extremely high peak loads from 5 to 9 pm in warm weather for watering lawns and for the approximately 30,000 patrons of nearby Roosevelt Race Track necessitated additional supply and distribution facilities. Improvements include a well (the tenth now in operation), engines, pumps and a 1.5-million gallon ground storage tank.

At the new station, water is pumped from well No. 12, under the pumphouse, to the storage tank, just south of the building. A 50-horsepower General Electric three-phase AC electric motor powers a 10-inch Layne-Bowler deep well turbine pump. Turning at 1160 rpm, the pump can move 1050 gallons per minute.

During power failures caused by hurricanes, this pump will become a prime source of water for the district. Standby power is supplied by a Caterpillar D318 diesel engine connected directly to the pump. Although this engine is somewhat larger than required for the pump, it was selected for complete interchangeability with the other two diesel engines in the installation. This diesel engine insures a supply from the well even when electric power is off.

Up to 1,500,000 gallons of water can be held in the ground storage tank. This reinforced concrete tank, half underground, is 120 feet in diameter and 20 feet deep. Side walls are 16 inches thick, the bottom 6 inches thick, and the top 5 inches thick.

As the peak load comes on to the system, a 60-horsepower three-phase Fairbanks-Morse electric motor, powering a 6x5 F-M turbine pump, automatically starts to maintain the required 160-foot line pressure. New telemeter gauges and equipment located in my office across town give warning of the rising consumption. If additional pumps are needed only a few minutes are needed to dispatch an operator to the pumphouse (well No. 12) to start up the two diesel-powered booster pumps. These are Caterpillar D318 Diesel Engines which drive 8x6 DeLaval horizontal centrifugal pumps. At 1800 rpm, each pump produces 1600 gallons per minute against a 160-foot head. For extreme conditions, the two diesel-powered and one electric-powered pumps can be combined to provide up to 4200 gpm to maintain the 160-foot line pressure. A Nash vacuum priming system keeps the pumps ready to work.

Sufficient fuel for the diesel engines for more than a month of operation is provided by a 5000-gallon underground tank. This tank capacity permits purchasing tank-truck lots of fuel for greatest discounts.

This new facility has been under construction on a piecemeal basis for the past two years as funds have become available. It was put in operation the first of last October. Part of the $300,000 required was available in budget funds, but the remainder had to be raised by a special bond issue.

Angus D. Henderson, consulting engineer, designed the project. The Layne-New York Company, Inc., drilled the well. S. F. Musselwhite, Inc., constructed the building, and D. Fortunato Inc., constructed the storage tank. Booster equipment was supplied and installed by the Turbine Equipment Co. Board of Commissioners for the Westbury Water District are Joseph J. Summa, Chairman; Marvin C. Baldwin, secretary; and Joseph F. McKenna, treasurer.

● ● ●

Highway Maps Printed

The Michigan State Highway Department printed 600,000 maps for free distribution upon request during 1957. The 1958 edition will have new symbols, type, color and a new base.

Road Maintenance in a New York County

Patching crews used 3,612 tons of blacktop, produced by the county-owned mix plant, on repair of Lewis Co., N. Y. road surfaces. A total of 60.5 miles of the County Road System received surface treatment using 131,690 gallons of asphalt and 3,885 tons of crushed stone. Culverts were cleaned and 15 were replaced. The bridge maintenance crew repaired and painted 33 county bridges. All roadsides were mowed and chemical brush control was continued by county forces. Many over-age trees were removed where they presented a hazard to the use of roads. All road direction and warning signs were inspected and replaced or painted where necessary. It was again necessary to expand considerable funds to remove accumulations of litter from the roadsides. Were this not done regularly the roads would soon have the appearance of one continuous garbage dump. This expense caused by thoughtless persons could well be eliminated and the men placed on constructive work.

These data are from the annual report of I. Ray Geer, Superintendent of Highways of Lewis County, New York.

Pedestrian Overpass Reduces Traffic Danger

AN OVERHEAD pedestrian crossing, the Sky-Walk, has been constructed over a busy street in Lansing, Mich. Traffic was quite heavy in the morning and evening; and the speed limit of 45 mph was often exceeded; and at a school crossing a watchman costing about $2500 per year was required. The Sky-Walk eliminated the need for a watchman and it is estimated that this saving will pay for the installation in less than five years.

The Sky-Walk is, in effect, a package of standard components which can be adapted to a variety of situations. Support is provided by four-column towers at either end. Spans, which may be up to 82 ft., are set into saddles on the towers and bolted into position and together. The stairways are also bolted to the towers which, in turn, are bolted to poured-in-place reinforced concrete foundations. Thus, everything but the foundations is movable and can be expanded or relocated.

Normal clearance is 15 ft., but can be more or less. Flooring and stair treads are of 12-gauge open-grid steel grating. Railings and frames are 1⅝-in. steel tubing and structural members are also steel tubing. The entire walkway is enclosed for safety and to prevent throwing objects into or ahead of cars.

THE NEW MINIATURIZED WILKINSON LINE LOCATOR MODEL W-3

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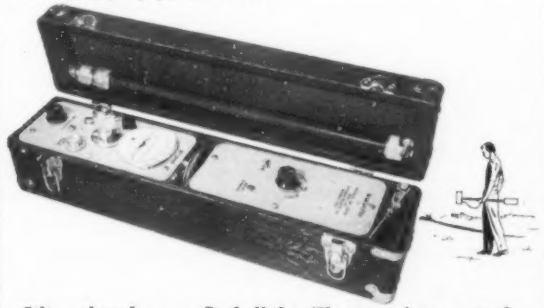

It's as handy as a flash light. The transistors rarely, if ever, require replacement; non-leak mercury cells outlast old type batteries at least ten times. The instrument cases are molded glass fibre. The aluminum connecting handle telescopes to 17 inches, and the entire instrument comes in a substantial carrying case.

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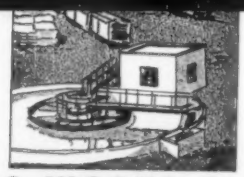


PUBLIC WORKS DIGESTS

Prepared by
CLAYTON H. BILLINGS
Associate Editor

THE INDUSTRIAL WASTE DIGEST

State-Wide Air Pollution Survey

In order to survey the many and varied sources of atmospheric contamination in New Jersey, the State Department of Health concentrated its efforts on measures to detect airborne particles, which are expected to be present in varying quantities almost everywhere. An experimental air testing project termed "State-Wide Air Pollution Survey—Smoke Index," was conducted February to December, 1956. The objectives were to obtain an index of atmospheric concentrations to serve as a basis for evaluation of the distribution of smoke contamination, to determine seasonal variations, to classify municipalities on the basis of air sanitation, and to obtain background data to evaluate future programs and complaints. The instrument selected for the study is the A.I.S.I. Smoke Sampler made by the Research Appliance Co. The sampler operates on the principle of filtering a definite volume of air through a periodically advanced filter paper tape. Twenty-one test sites were selected to obtain satisfactory geographical distribution. The experiment demonstrated that it would be possible to develop a routine procedure for state-wide continuous air testing, with some modification in the field and laboratory procedures used in the study.

"State-Wide Air Pollution Survey —Smoke Index." By William A. Monroe. *Public Health News*, New Jersey State Department of Health, August, 1958.

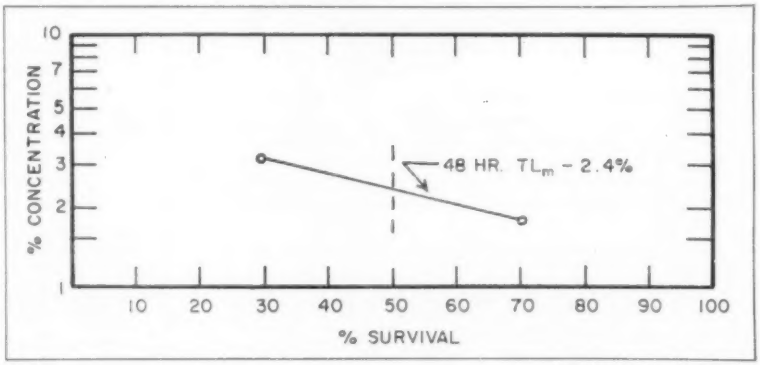
Fundamentals of Bioassay Procedures

The basic bioassay procedure consists of exposing different concentrations of an effluent, usually in a logarithmic series, to selected test fish and observing the reactions of the fish over a definite time period. The dilution water used should be from the receiving stream above the point of effluent discharge or should be a water similar to it in pH, alkalinity and hardness. The test period is usually 96 hours and 24, 48 and 96-hour median tolerance limit concentrations which cause 50 percent mortality (TL_m) are estimated by interpolation. In applying test data for a particular effluent the required dilution water can be calculated and a numerical factor may be developed that will assure safety to aquatic life in the stream. This factor involves: 1) Relating laboratory bioassays to actual conditions, 2) relating test fish to other aquatic life, 3) considering the variability in the effluent toxicity, and 4) considering variation in water characteristics and synergism and antagonism. The factor is applied by multiplying its numerical value by the calculated amount of dilution water corresponding to the determined TL_m. By using bioassays, an industry can not only judge the toxicity of final effluents and probable effects on receiving waters, but can trace toxic components in process effluents. If toxicity of a waste is primarily from a component small in quantity, it may be found unnecessary to treat all of the waste. Determining the effectiveness of treatment processes and establishing locations for new plants are additional uses of bioassays. Research is needed to establish application factors for different wastes and types of receiving waters. Such research might consist of basic laboratory work, field studies of streams and industries, and studies with operating plants.

"Bioassay of Chemical Wastes Prevents Serious Fish Kills." By Croswell Henderson. *Wastes Engineering*, September, 1958.

Color Removal in Sewage Plants

The day has passed when the over-all objectives of waste treatment consist of BOD and suspended solids reduction. Color is one of the additional characteristics that needs consideration. Color removal efficiencies by various treatment methods used today were evaluated by a study which involved two phases. A questionnaire was sent to 386 treatment plant superintendents. The second phase consisted of field experiments conducted at Burlington, Salisbury and Greensboro, North Carolina sewage treatment plants. Influent color characteristics of sewage from each plant were determined to establish a minimum transmittance wave length. Effluent samples were then measured for light transmittance at the corresponding wave length, permitting graphical determination of color reduction. Only 10 percent of the 138 superintendents answering the questionnaire measure color in sewage, reporting efficiencies in color removal amounting to 43 percent for primary plants, 84 percent for trickling filter plants and 93 percent for activated sludge plants. The field experiments, which were performed on plants highly loaded with industrial wastes, indicated that the primary plant showed an increase in color and that the removal efficien-



Courtesy Wastes Engineering

● **FISH survival tests at two concentrations help locate 50 percent mortality point.**

AMERICA'S *FIRST* COMPLETE SERVICE TO THE SEWAGE TREATMENT INDUSTRY— *Smith & Loveless* FACTORY-BUILT LIFT STATIONS AND SEWAGE TREATMENT PLANTS

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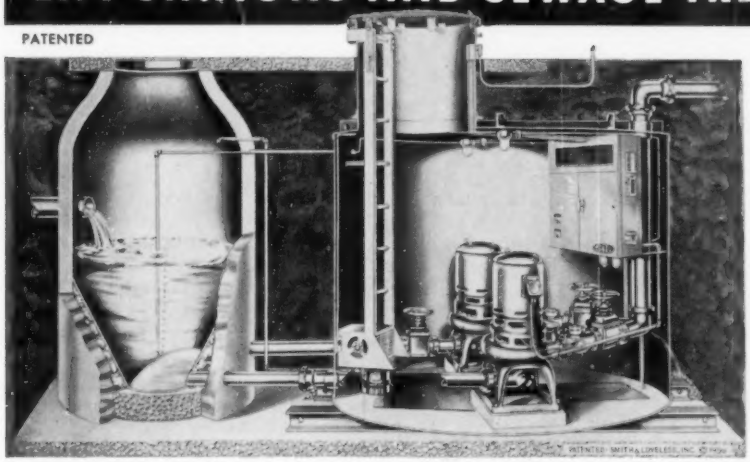

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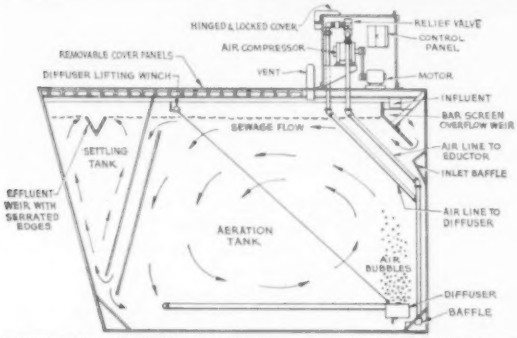
Precision assembled, central electrical control cabinet prewired and color coded, dehumidified interior to prevent condensation. Pumps have pressurized mechanical seals. Low in initial cost and easy to install. Smith & Loveless stations are designed to provide maximum efficiency and long life with a minimum of maintenance.

Smith & Loveless offer a complete line of standard size factory-built lift stations with capacities up to 4500 G.P.M.



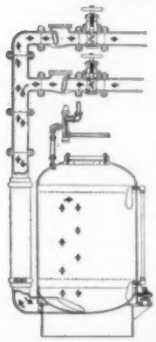
Smith & Loveless "OXIGEST" SEWAGE TREATMENT PLANT

A high-quality, low-cost sewage treatment plant for sub-divisions, schools, motels and industrial plants. The "Oxigest" plant has been carefully engineered for dependable treatment without requiring the services of a skilled operator. Approved by F.H.A. and State Health Departments where submitted.

Built of the finest materials and properly reinforced to withstand interior and exterior pressures. The Smith & Loveless "Oxigest" will provide a permanent plant with minimum annual maintenance. Smith & Loveless also provide a complete line of "Sy-No-Seal" rotary distributors and other sewage treatment equipment.

Write for Smith & Loveless "Oxigest" data manual with design notes, specifications, drawings, etc.

Smith & Loveless "WAY-O-MATIC"



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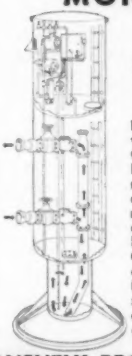
Ideal for installations requiring 200 G.P.M. or less. The "Way-O-Matic" Ejector practically eliminates maintenance as the sewage does not come into contact with any of the controls. Built of finest materials to provide maximum performance at factory-built prices. The "Way-o-matic" may be ordered as a separate unit or in a complete lift station. Cutaway drawing shows operating principle.

Smith & Loveless "MON-O-JECT"



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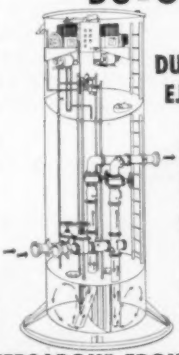
Designed for small installations of 200 G.P.M. or less. Completely automatic, extra large air storage. Requires minimum maintenance. Built of the finest materials and meeting the same high standards set by all Smith & Loveless lift stations. The "Mon-O-Ject" provides high-quality equipment for the modest budget. Requires minimum space underground. Cutaway drawing shows construction details.

Smith & Loveless "DU-O-JECT"



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cies in a standard rate trickling filter plant and in a high rate filter plant were 34 and 44 percent, respectively.

"Color Removal in Waste-Water Treatment Plants." By N. L. Nemerow and T. A. Doby. *Sewage and Industrial Wastes*, September, 1958.

Vitamins from Citrus Waste

Previous work by the authors had established that citrus waste waters can be readily treated by the activated sludge process. It had been determined also that the sludge contained vitamins of the B group which would give it a value between that of dried whey and dried distillers' solubles if used as a chicken feed supplement. To obtain more complete data, a laboratory scale, three-stage activated sludge system was placed in operation, and an efficient culture was developed with the aid of additions of sodium nitrate and trisodium phosphate for nitrogen and phosphorus sources. Varying amounts of cobaltous chloride were added to the raw waste in an attempt to increase the production of vitamin B_{12}. After the culture was developed, fifteen separate runs were made, each covering a space of a month using varying amounts of cobalt, nitrogen and phosphorus sources. The withdrawn sludge was sampled, filtered and dried each day. The dried sludge samples were analyzed for thiamin, niacin, riboflavin, pantothenic acid and vitamin B_{12}. The crude protein content was also estimated. It was concluded the citrus waste sludge contains significant quantities of the B group vitamins and a high protein value. The vitamin B_{12} content places it in a position to be considered as a vitamin B_{12} supplement in chicken feed. The vitamin yield was found to be directly affected by additions of nitrogen, phosphorus and cobalt source chemicals. The use of prolonged heat in drying appears to be destructive to vitamin B_{12} and thiamin, and drum drying is superior to oven drying.

"Activated Citrus Sludge—Vitamin Content and Animal Feed Potential." By Marshall H. Dougherty and Robert R. McNary. *Sewage and Industrial Wastes*, September, 1958.

Radioactivity and Sludge Digestion

In view of the potential increase in radioactivity levels in sewage, a series of investigations was undertaken to establish the distribution of radioactivity from digested sludge and to determine the level at which P^{32} and I^{131} would exert deleterious effects on the digestion process. Sixteen laboratory digesters served as the experimental units, with fresh and digested sewage solids being obtained from two Atlanta, Ga., sewage treatment plants. Four of the digesters were equipped for recirculation to avoid fouling the electrodes used for continuous measurement of pH, ORP and conductivity. Quantitative measurement of gas production and of volatile acids was used to observe the progress of digestion. Qualitative analytical techniques applied were measurements of liquid conductivity to determine the breakdown of solids with digestion progress, ORP to indicate the reactivity of the substrate and qualitative analysis of the decomposition gases by chromatographic methods. To determine the distribution of radioactivity in the liquid, solid and gaseous phases, the evaporation technique and the Marinelli beaker method of radioassay were employed. The presence of P^{32} in an initial concentration of 50 mc/L or more appears to reduce the rate of gas production and the ultimate total gas production. However, since the same behavior was observed in controls to which equivalent

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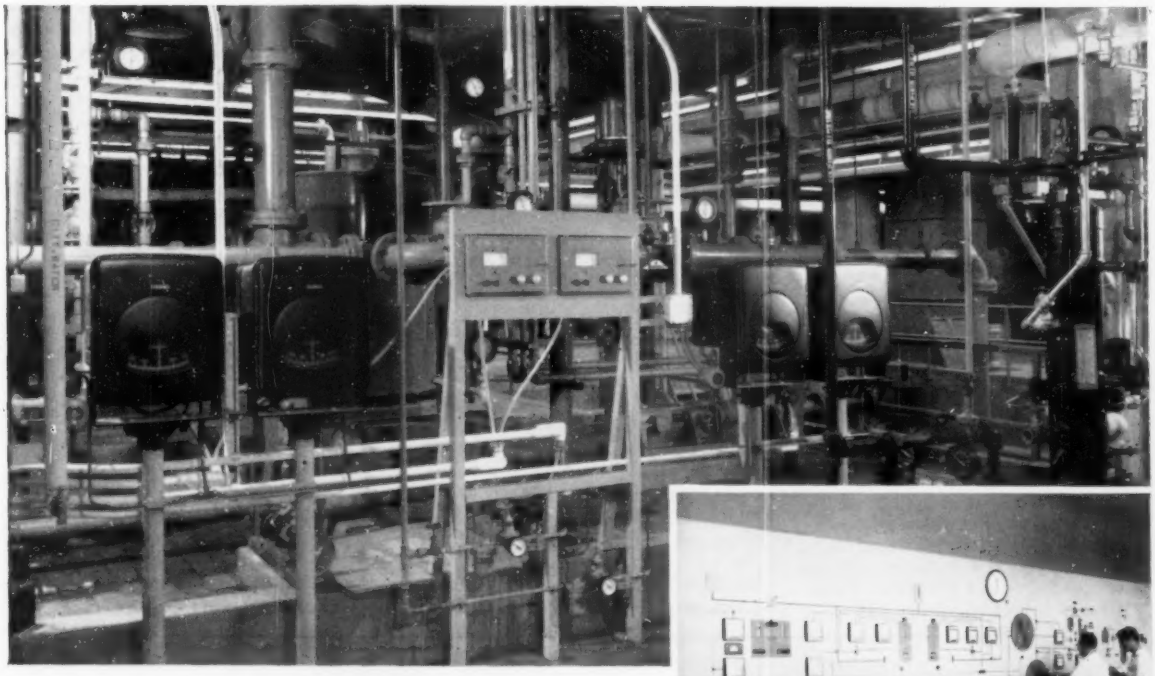
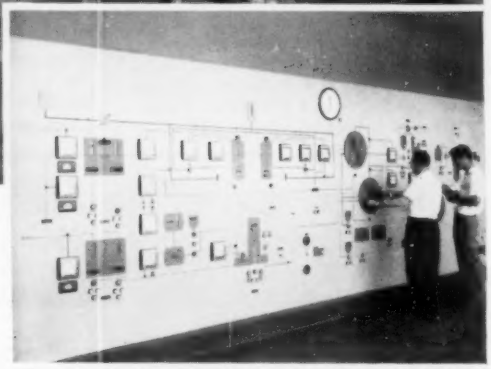
Airplane Company...

• Four Foxboro Dynalog oxidation-reduction potential transmitters form the heart of this Chromate Waste Reduction System at Boeing Airplane Company. Dynalog instruments transmit pneumatic signal to remote control panel (below). Two Beckman pH Amplifiers can be seen in the center. Consulting engineers: Wilson & Company, Salina, Kansas.





Central Graphic Control Panel for Boeing's Industrial Waste Treatment Plant. Panel includes controllers for flow and liquid level of various tanks, as well as recorder-controllers for the Foxboro ORP meters.

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WASTE CONTROL SYSTEMS

amounts of stable KH_2PO_4 were added, it is concluded that the gas production is due to chemical toxicity rather than to a radiobiological effect. The presence of radioactive or stable phosphorus was found to reduce the fuel value of the digester gas about one-third. The uptake of P^{32} by the solid component in digested sludge increases exponentially with an increase of initial concentration of P^{32} and seems to be greater for digesters provided with mixing equipment.

"Effects of Radioactive Materials on Anaerobic Digestion. I. Radiophosphorus." By Werner N. Grune, Donald D. Bartholomew, and Cecil I. Hudson, Jr. *Sewage and Industrial Wastes*, September, 1958.

Other Articles

"Basic Data for **Chemical Waste Disposal.**" By Robert W. Haywood, Jr. New techniques for providing a clearer definition of waste and receiving water characteristics are being discovered, and there is more comprehensive understanding of old ones. Sewage and Industrial Wastes, September, 1958.

"Industrial Wastes in **Municipal Sewage Plants.** Part I." By Theodore Jaffe. This is a part of a series on sewage works operation and discusses characteristics of industrial wastes and some laboratory tests required to handle such wastes in municipal sewage treatment plants. Water and Sewage Works, September, 1958.

"Determination of **Sulfur Oxides in Stack Gases.**" By Edwin B. Seidman. Sulfur trioxide in stack gases as low as 0.001 percent gas volume may be determined in the presence of 0.03 percent gas volume sulfur dioxide. Analytical Chemistry, October, 1958.

• • •

Soil Erosion Problems

(*Continued from page 94*)

Sand dunes develop wherever loose sand is exposed to the wind. The particles are lifted only a slight distance above the land surface, hence their movement is often interfered with by surface obstacles, such as grass, shrubs, buildings, fences, etc. which result in deposition and accumulation of the sand in piles.

The problem of 'fixing' dunes, to prevent wind erosion such as this, is a problem for engineers and others, which has been dealt with in Ocean County. Transplanting beach grass in some sections has given relief. Wooden slat fences similar to snow fences have been used with good results to build up a continuous line of beach barriers of sand. At some places it has been necessary to construct bulkheads of timber in an effort to stop the blowing sand.

Wave Action On Shore Roads

In addition to wind erosion along the beach roads and even more important is the destructive erosion to roads due to wave action of the waters of the Atlantic Ocean and of the waters of the large areas of bays in Ocean County. This represents a type of erosion which has long been a worry to engineers and governments, and which often obstinately refuses to 'stay put' after much money and time have been spent on improvements.

Roads subject to the action of bay waters are usually protected by the construction of creosoted timber bulkheads or turf bulkheads parallel with the roadways. Sometimes roadway slopes are protected by piling bags of sand mixed with cement one on another to make a stable wall for the water to dash against.

Along the Ocean, however, the type of construction must be more sturdy. Many different forms of walls, bulkheads and jetties have been constructed in an effort to protect roads and adjacent property,

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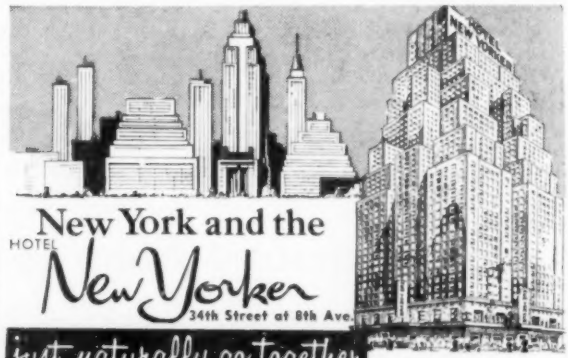

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but even with well designed structures failures occur due to the unlimited powers of the sea. Usually this type of protection involves concerted effort all along certain sections of the shore by various interested parties, and usually involves construction of elaborate and costly structures.

Summing up the various erosion problems it is evident that some methods have been developed to cope with the various situations and as money is available these methods are carried out; but there still remains an unlimited amount of work and new methods to be thought of and developed.

• • •

Subdivision Control

(*Continued from page* 109)

laterally from a rear lot pole to each street light pole. This is, perhaps, the neatest installation obtainable with wood poles. When lot depths exceed 140 ft., open conductors are run from pole to pole along the street. Usually lighting units are installed on every other pole. Spacings will vary with lot widths and will average between 200 and 250 feet.

Because both vehicular and pedestrian traffic is very light in strictly residential areas, 2500 lumen lamps in glassware are generally specified. The average annual cost per 2500 lumen unit which includes installation, operation and maintenance is $30.

I think we in West Seneca are fortunate to have under construction a subdivision of multiple units. In fact it is the first of its kind in the United States. This subdivision is being built and financed by Webb & Knapp. The architectural firm who designed this most unusual subdivision is Carl Koch & Associates of Cambridge, Mass.

The following is a general outline of the process followed to evolve the solution so it was acceptable to the town of West Seneca.

Basic Design Concept

The minimum number of units which would make the project economically feasible in respect to land cost, utility cost, roads and site improvement and building costs was determined. It was found that a minimum of approximately 200 units would be necessary to keep prices within a salable limit for financing.

Individual lot sizes are set by FHA standards. Using detached houses entirely, the 200 units which

Note full size tool boxes, retractable dolly, spring towing eye.

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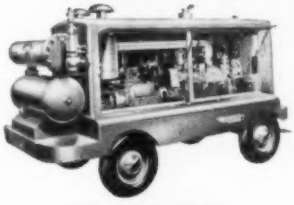

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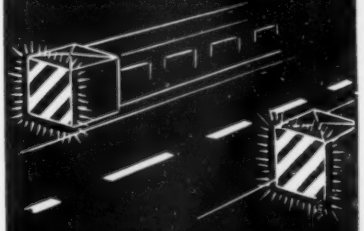

Low first cost — low upkeep — plus fully effective night and day protection is assured with Type H Safety Spheres. Terrific bead brilliance. Long lasting! Apply with ordinary traffic paint at pennies per square foot. Write for details.

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the town requested for this area could not be approached. The town house concept was born.

With the above determining factors, Hideo Sasaki, landscape architect, was consulted on making the site plan the most pleasing possible. The town house itself was analyzed in plan, exterior appearance, economics and relation to site. The plan was developed to meet FHA requirements simultaneously with incorporation of abstract qualities such as aesthetics and livability. The resulting solution arrived at was an entrance between the first and second floors on the main entrance side and at grade to the first floor living rooms on the garden side. The first floors on the garden grade level were the play, living, dining and kitchen areas. The second floor was designated for bedrooms.

The garden side called for careful treatment in order to obtain an orderly effect and still maintain individual private patios and gardens for each living unit. To achieve this, fences, outdoor storage boxes and trellises in varying patterns were used.

The road pattern was developed with consideration of existing roads to tie into requirements for lot sizes. This pattern was changed somewhat as progress was made in development studies.

Basic Site Plan

The first resulting site plan from these criteria was paired row houses with an entrance court between. Parking was provided at the ends of the units as a group. This scheme was discarded because of FHA and local requirements for parking at each individual lot. The developer believed this to be far the superior site arrangement and the most pleasing in livable assets.

The final plan was developed through adjustments made during the process of acceptance by local authorities (this was complicated by the site being located in two towns —Buffalo and West Seneca). The building sizes were varied to eliminate the monotony associated with developments using the same size house throughout. Every other unit was set back an additional 18 feet for the same reason.

The plan now includes wide parkway streets with green planting at center strips. Ample parking has been provided so that each tenant or owner may park directly in front of his unit and there is additional space for guest parking. Sidewalks in front are provided, plus asphalt paths in backyard easements leading to one of the two large recreational areas in the site. For an extra amount, there are spotted carports at numerous units to provide variation. All units have covered entrance porches with some trellises in the front yards, as well as in the gardens. There is ample storage for each unit both inside and out. The contract, for construction of this subdivision will include basic landscaping such as lawn, trees and shrubs.

I think the town of West Seneca has accomplished its primary object in making this subdivision an outstanding place in which to live. As I stated in the beginning of this article, subdivisions just grow upon a locality. We in West Seneca have had to come far in our planning and requirements to make the town a progressive community. However, we have by no means reached an all-time solution to our problems of subdivisions. Right now a new and more complicated problem of state and county institutional expansion within our town is causing us to investigate our planning and requirements for subdivisions. So this is an everchanging problem in local expansion and to take heed of this fact is to provide a better town for the future.

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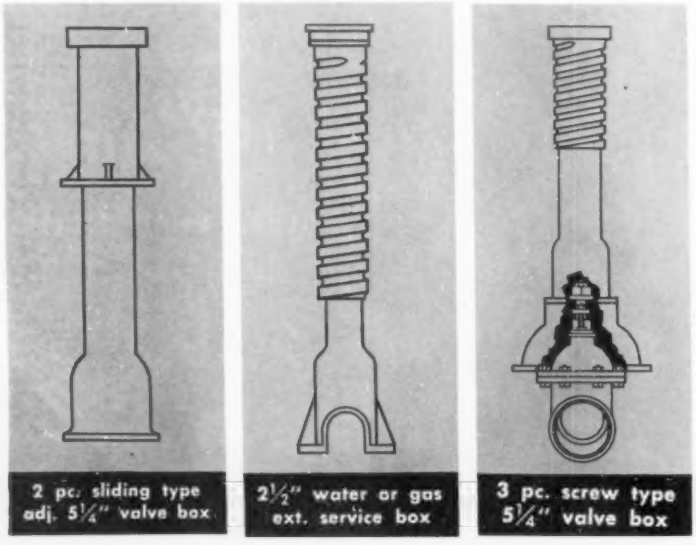

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GORDON H. LLOYD,
Executive Secretary,
Employees Retirement System of Texas

ECONOMIC and social developments of the recent years since World War II have created a rapid growth of interest in the purpose of providing income for retired workers. Retirement must be effected in a manner which is fair and equitable to an employee, and which meets the social obligation of the employer, both from the humanitarian and economic standpoint. An employee retirement plan is primarily an instrument of personnel administration, and both management and employees have certain objectives which they expect a retirement plan to help them achieve.

To permit Texas State Departments to compete with private industry in securing and holding trained employees, a constitutional amendment was adopted at the General Election held in November, 1946, and the Employees Retirement System of Texas was created to become effective September 1, 1947.

Consideration and study was given in 1953 to changing the Retirement System to permit a broader coverage and more attractive benefits to employees, but action was deferred for the purpose of consideration of social security benefits, which was authorized by the legislature and became effective for all State employees in 1955.

Recognizing the need for an independent and impersonal study of the retirement problem, the Board of Trustees of the Employees Retirement System requested the Texas Research League to make a thorough and comprehensive study. In compliance with this request the Texas Research League engaged topflight consultants and actuaries and made studies of retirement systems in 38 states, in addition to retirement plans of large municipalities, industries, commercial and financial organizations. Upon the results of this study and recommendations of the Texas Research League, the new retirement act is based.

The employees of State Departments in Texas are now covered by a new retirement plan and social security and these provide separate retirement income without restrictions or complications regarding any connection between the two agencies, although in preparation of the new retirement act to become effective September 1, 1958, benefits applicable under social security were taken into consideration to provide a joint but an adequate retirement income for Texas State Employees. Approximately 40,000 State employees are covered by the Employees Retirement System, and participation in the System is a condition of employment.

Retirement contributions are 4½ per cent of the total gross income of the employee with no limitation on the income. Benefits in general are paid on the basis of the average 60 highest consecutive months' salary during the 120 months of employment prior to the date of retirement, and for service retirement the benefits are based on a percentage of this salary under the following schedule: First 10 years service, 0.75 percent per year; second 10 years service, 1.25 percent per year; third 10 years service, 1.50 percent per year; and all subsequent years, 1.75 percent per year. A minimum retirement benefit of $30 per month is provided.

Service Retirement

To obtain service retirement benefits a worker must have attained the age of 60 with 10 or more years of service; but a minimum retirement age of 55 with 30 years is possible. Members receive full retirement at age 60, but if retired at an earlier age the annuity is reduced.

Based on accumulating 35 years of service with an attained age of 65, the retirement income is shown in Table 1. These benefits are for the worker only and not for any additional benefits for dependents under social security.)

These examples are based upon a straight life annuity for the employee alone, although there are 4 reduced optional plans available to the member when he retires. The optional plans are time certain or joint survivorship and the reduction depends upon the age of the member and nominee, and if male or female.

State employees who are commissioned peace officers engaged in criminal law enforcement activities with the Department of Public Safety, Game and Fish Commission, Liquor Control Board, or State Prison System may retire with an attained age of 5 years less than other State employees and receive comparable benefits.

Any State employee who has retired, or does retire in the future, will be permitted to resume actual employment with a State Department or Agency on a temporary basis, but such re-employment shall not be for a longer period than 9

Table 1—Retirement Income

	Assumed Monthly Salary Levels			*Monthly Benefits*		
Type Employee	*Start*	*Final*	*High 5 Yr. Avg.*	*Social Security*	*Employees Retirement*	*Total*
Female Clerk	$ 175	$ 300	$ 300	$ 92.70	$ 131.25	$ 223.95
Male Tab. Mach. Techn.	255	320	320	99.50	140.00	239.05
Male Laborer	182	338	338	96.70	147.88	244.58
Female Secretary	175	350	350	102.30	153.13	255.43
Male Engin. Techn. ...	200	460	460	104.10	201.25	305.35
Male Acctn't.-Admin. .	300	520	520	107.90	227.50	335.40
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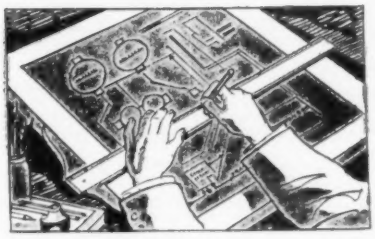

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months within any one state fiscal year. During the time of re-employment the retired member will not contribute to the Retirement System, but will have his retirement annuity suspended and resumed immediately upon ceasing the temporary employment. No change will be permitted in the retirement plan selected.

Disability Retirement

Any member becoming totally disabled before age 60 with 10 or more years of service may retire on disability retirement with the benefits calculated in the same way as service retirement, but provided that the disability annuity from the Employees Retirement System shall not be less than 25 percent of the last salary. If any person becomes totally disabled in the line of duty or as an occupational disability, regardless of service or age, he will be entitled to an occupational disability annuity of 60 percent of his last salary or compensation, but if the member receives other compensation because of the occupational disability where State funds are involved, such amounts will be deducted from the 60 percent occupational disability retirement annuity and the balance paid.

In no event would a member retiring on disability be permitted to select an optional retirement plan.

Death Benefits

If any member dies prior to accumulating 20 years of creditable service, the Retirement System will refund to his designated beneficiary the total amount contributed by him to the System plus interest credited to his account. In the event that the member's death is in line of duty, or an occupational death, then the Retirement System will refund to the named beneficiary of the member a full year's salary at the rate of pay the member was receiving at the date of his death, in addition to his contributions plus interest.

If the member has accumulated 20 years or more of creditable service with the System, then he will be permitted to select an optional retirement plan, either joint survivorship or time certain, and in the event that he dies while employed by the State but before retirement, the System would declare the retirement plan selected by him as effective at the end of the month in which he died and the month following would begin annuity payments to his nominee for life as a joint survivorship plan, or for the time certain if such a plan was selected by him.

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Any member who resigns and leaves State employment may secure a refund of his contributions without interest if he has worked less than 5 years, but in the event he has worked for a longer period the system will refund his contributions plus interest.

Due to high values on prior service for members of the System in the retirement law in effect before September 1, 1958, certain employees would receive a greater annuity than provided under the new act. Therefore, for a period of 10 years after September 1, 1958, the new law provides that in the event a person would receive a greater annuity under the retirement law in effect prior to September 1, 1958, then such amount would be paid to him in lieu of the benefits to be paid under the new retirement act.

General

The reserves of the Retirement Systems are fully funded and a competent actuary is retained on a consultant basis to advise the Board of Trustees concerning reserve requirements. There are seven members of the Board of Trustees, three of whom are State employees elected by the membership of the System; three are appointed, one by the Governor, one by the Chief Justice of the Supreme Court, and one by the Speaker of the House; and the seventh member is the Attorney General of Texas.

The Employees Retirement System of Texas is a comparatively new organization. Retirement funds accumulate rapidly, and accelerate as years pass. It has been estimated that the size of the Employees Retirement Fund would amount to approximately $125,000,000 within five years and $250,000,000 in approximately 14 years from this date. Under the Texas Constitution, and also in the Retirement Act, these funds are invested 50 percent in Government Bonds and 50 percent in corporate securities, including common and preferred stocks, bonds and debentures, and/or government guaranteed mortgage loans.

No new taxes are provided for the operation of the new retirement system. The State matches equally the contributions of each employee, and the matching is derived from the fund from which each employee is paid. The operating cost of the System is met by $2 membership fee from each member each year, plus any additional amounts needed obtained from the interest earned from investments.

Realistic Annuities

In preparing the new retirement act for Texas State Employees, effort has been made to make the retirement annuities more realistic in taking the 5 highest consecutive years' salary during the last 10 years of service as a basis for retirement annuities. This will provide an annuity more closely associated with salaries and living cost at the time of retirement and permit retired employees having technical, supervisory or executive positions to obtain larger retirement annuities than provided by preceding retirement legislation.

Every effort has been made to secure competent and efficient personnel for State Departments and retain them until attaining the age of 65, which is considered a normal retirement age, and at which time the employee would receive benefits from both social security and from the Retirement System. Under this revised retirement income program provided by the State of Texas for its State employees, there is an assured income of approximately the same "take-home pay" at the time of retirement for those who have been employed for approximately 30 years and upwards and who are receiving a gross pay of approximately $750 per month or less.

We believe a forward step has been taken in adjusting the retirement program and in the addition of social security benefits. Neither restricts the other, but each supplements the other in a positive manner in providing for benefits; e.g. retirement income for the widow, upon death of the member with 20 or more years of service and still actively employed, would be available before any social security benefits to the widow, as would all other retirement benefits provided in the new act. We believe that under the retirement income plan in effect on September 1, 1958, the State will be able to retain efficient employees instead of losing them to private industry, and also the State and its tax payers will benefit from more efficient operation of State Government.

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PUBLIC WORKS
EQUIPMENT NEWS

Eyepiece can be turned any direction

Elbow Eyepiece For Gurley Alidade

A new elbow eyepiece has been added to the Gurley Alidade. Announced by W. & L. E. Gurley, the eyepiece fills the need for an instrument which will be easier to read in the field. It extends in a diagonal direction from the end of the Alidade telescope and can be rotated in any position and read from either side. Previously it has been necessary for the observer to place his eye close to the telescope and at a position which is sometimes awkward and inconvenient. The new eyepiece permits the topographer to view his target with greater comfort and convenience. It can be furnished in place of the standard diagonal prism of the Gurley Standard Alidade Model 582 and Gurley Explorers Alidade Model 580. For information on how to convert an older Alidade or obtain a new one with the elbow eyepiece write W. & L. E. Gurley, Alidade Dept., Troy, N. Y., or circle **No. 11-1** on the reply card.

Monatco Heater-Planer

This asphalt heater-planer, announced by Monatco Mfg. Corp., is developed for one-pass planing and reconditioning of asphalt streets, highways and airport runways. Series M-12 is a new and advanced design in heater-planers which places all vital parts of the machine out of the heat zone. This, together with the strictly-controlled reducing flame under the heating hood, eliminates the hazard of fire either to the machine or its surroundings, and the possibility of smoke nuisance. For complete specifications write Monatco Mfg. Corp., 1401 Woodland, Kansas City, Mo., or circle **No. 11-2** on the reply card.

Angle Gauge Saves Time In Bending Pipe And Conduit

Greenlee Tool Co. has developed the No. 1802 angle bending gauge that satisfies a basic need and saves time when bending pipe and conduit. A special notched protractor design allows the exact degree of bend to be locked in. Made of durable zinc plated steel with black figures, the gauge has an overall length of 70½ ins. Determining the degree of bend needed is simplified by setting the protractor to the angle desired and locking it in position. During the bending operation the gauge can be placed on the frame for easy checking and reference. Each gauge has informative bending data plus a handy rule. After the bend is completed, the gauge can be used to check the angle for accuracy. For additional information write Greenlee Tool Co., Rockford, Ill., or circle **No. 11-3** on the reply card.

Sherman Napco Four-Wheel Drive Unit

The new Sherman Napco Four-Wheel Drive unit is for adaptation on conventional tractors and makes possible operation on difficult terrain in any season. By increasing traction up to 40 percent, the Sherman-Napco permits complete utilization of the tractor. Power on the front wheels tends to reduce diving in soft sand and side slip while pushing loads on slick surfaces; and eliminates spinning of back wheels while grading or excavating with scraper or loader. For more data write Sherman Products, Inc., Royal Oak, Mich., or circle **No. 11-4** on the reply card.

Unit is for adaptation on conventional tractors and makes possible operation on rough terrain in any weather

Compactor has full hydraulic steering

Self-Propelled Pneumatic Compactors

Self-propelled, multi-tire pneumatic compactors in a range of sizes from 9 to 30 tons are announced by Eskridge Equipment Co. The 9-wheel to 15-wheel units have vertical oscillation which give equal compaction over the terrain. The driver sits on a swivel seat at the rear corner of the machine for better visibility. He can face either forward or rear to eliminate turn arounds and can steer the machine in either direction of travel. Entire machine can turn within a 26-ft. radius circle. Standard equipment includes a water sprinkler system and wheel mats over each of the wheels. For more details write Eskridge Equipment Co., 1214 S. Norwood Ave., Tulsa 12, Okla., or circle **No. 11-5** on the reply card.

Traffic Safety Warning Light

This warning light, announced by InterTel Electronics, Inc., has no moving parts and provides an engineered electronic pulsing unit housed in a powerful service-free signal device. The transistorized circuit flashing light with a neon element offers three-way protection. The light intensity may be pre-set over a wide range without change in circuitry. The units can be used as barricade warnings, traffic directional signals, airport clearance lights, parking area markers and hazard lights. For complete data write InterTel Electronics, Inc., 8467 Beverly Blvd., Los Angeles 48, Calif., or circle **No. 11-6** on the reply card.

Loader has a 2500-lb. lift capacity

Ford Loader Unit

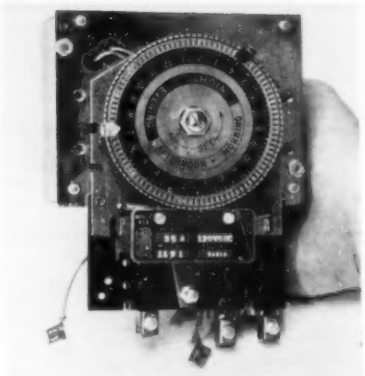
A tractor-loader unit with two and a half times the lift capacity of any previous Ford loader unit is announced by Tractor and Implement Division, Ford Motor Co. Larger and heavier than the familiar Ford general-purpose tractors, the new Ford industrial tractor, with a 7000-pound capacity front axle and heavy weight-bearing frame has great ruggedness. Its strength and capacity to withstand batterings and shock-loads is derived from a new concept of isolating such vital "equipment" as the driver, engine, hydraulic pumps, and steering system from the members of the tractor which take the biggest beating in industrial service. A malleable iron combination grille and bumper encloses and protects the headlights, cooling system, hydraulic reservoir and pump. An all power steering system with exclusive "feather touch" instant response and with a steering wheel requiring less than a complete turn to go from straight ahead to full right or full left, provides quick maneuverability and isolates the driver from kickback. The operator's visibility forward and alongside the tractor is unimpaired by cross bracing and steering rods. The tractor's engine develops 42.5 drawbar hp in the gasoline models. The Super-Duty loader, developed for use with this tractor, has a 2500-lb. capacity, 5500-lb. break-away limit, lift height of close to 11 feet, and regular material bucket sizes of ⅝ and ¾-cubic yard. Two models of the industrial tractor are offered, the 1821 which is a standard-equipped model and the 1841 model which in addition to standard equipment has power take-off and an internal hydraulic system with three point linkage for rear attached equipment. For more details write Public Relations Dept., Tractor and Implement Div., Ford Motor Co., Birmingham, Mich., or circle **No. 11-7** on the reply card.

Rovico Fotomate Doubles Copying Speed

Fotomate photographic copying machines, announced by Rovico, Inc., include developments which more than double the copying speeds of its all-purpose equipment. The new Rovico models feature larger throat capacities of 12 ins. in the Standard, 16 ins. in the Executive and 20 ins. in the Copymaster. The machine is designed for sideways feeding. All Rovico machines make permanent copies from any ink, crayon, carbon or non-carbon based material in any color from any paper. They copy both one and two-sided originals, either opaque or transparent, and can make multiple copies of both. For more data write Rovico, Inc., Newark, N. J., or circle **No. 11-8** on the reply card.

Time Switch Safety Factor For Traffic Signal Control

The availability of what it terms the first fool-proof Reserve Power on time switches has been announced by Tork Time Controls. The unit was designed to meet the need of municipal signal and lighting engineers for the continued operation of time controls in the event of power failures. This continued operation requires no winding, maintains on-time operation during

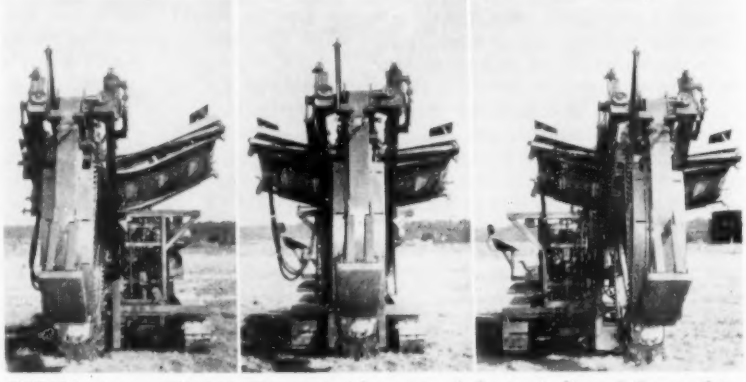


Time switch will work without power

even prolonged outage periods, and is on duty even in the event of a series of outages within a short span of time. Eliminating the need to dispatch service crews to adjust time controls after outages, the Reserve on time operation is an important safety factor. The Reserve is available on all Tork time switches used for the control of street lighting and traffic signals, including Astronomic models, 24-hour dials, and multiple-program switches. Further information is available from Municipal Div., Tork Time Controls, Inc., Mount Vernon, N. Y., or circle **No. 11-9** on the reply card.

Trencher With Shiftable Boom and Vertical Tilt

The Cleveland Trencher Co. announces the new Trencher Model JS 30, which can dig to a depth of 5½ ft. and from 11 to 24 ins. in width. New features include the following: A shiftable boom, which shifts 30 ins. to either side of the centerline of the machine; a hydraulic vertical tilt digging wheel, that tilts 7 ins. in either direction at the bottom of the digging wheel; V-conveyor; and a dual hydraulic conveyor drive, with variable speeds from 215 fpm to 1000 fpm. Other features include 48 crawler speeds, 4 digging wheel speeds, and a crawler kick-out clutch. A 4-cylinder 56-hp diesel powers the trencher. The unit can be used in digging pipe lines, footings, highway widening, sewers and bell holes. For full details write The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, O., or circle **No. 11-10.**



Shiftable boom will shift 30 ins. to either side of the centerline of the machine

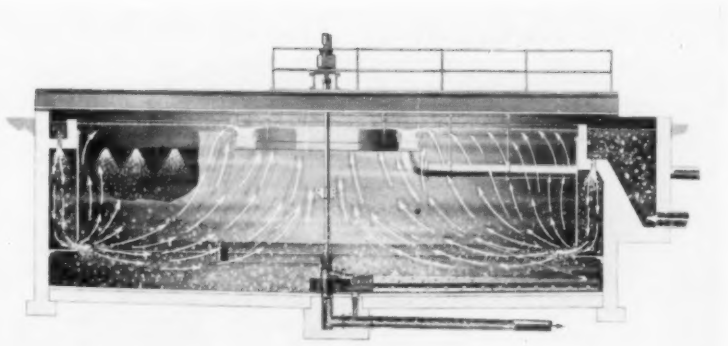
Diatomite Pressure Filter

A new intermediate size Diatomite pressure filter designed for swimming pools has been announced by Romar Filter Corp. Known as the Suburban, the unit is built in two models with average capacities of 4200 and 7200 gph, and filtering surfaces of 35 and 60 sq. ft. It is said to provide maximum filter area, longer operating cycles, slower pressure-rise and extremely compact design. The larger model needs only 9 sq. ft. of base space and 5½ ft. headroom. Pools with capacities of 20,000 to 80,000 gallons can be handled by single units; tandem installation handle pools of 125,000 gals. capacity and upward. Cleaning time is only 10 minutes. For more data write the Romar Filter Corp., Milwaukee 12, Wisc., or circle **No. 11-11** on the reply card.

New Line of Ottawa Backhoes and Loaders

The new Ottawa Model LX backhoe, which digs to a depth of 12½ ft. in any position of a continuous 190° arc of swing, and the Ottawa front end loader, are now available

for Oliver industrial wheel tractors. Outriggers, boom structure and mechanism of the backhoe are supported by a strong A-frame, which forms an extremely rigid foundation for digging and loading at any angle up to 95° right or left from centerline of tractor. The turret type seat pivots with boom for perfect operator visibility while digging deep trenches, or loading into trucks. A quick on-and-off feature makes it possible to remove the backhoe in 5 minutes when the tractor is needed for other work. The ejector bucket automatically forces out all wet, sticky material from the bucket during the dumping cycle. The loader can be operated with only one lever, and the backhoe with only two levers. For complete information write Ottawa Steel Division, Young Spring & Wire Corp., Ottawa, Kans., or circle **No. 11-12** on the reply card.



Cutaway view of Rex Rim-Flo clarifier illustrating the unique design principle

New Hydraulic Principle For Circular Settling Tanks

A new circular clarifier has been introduced by Chain Belt Co. to provide a number of important features which assure improved efficiency in circular settling tanks. According to the manufacturer, this new development, called the Rex Rim-Flo, provides maximum hydraulic efficiency, maximum use of tank volume, optimum settling conditions, greatly increased capacity and simple scum removal. Laboratory tests indicate that loadings in excess of twice those of conventional circular clarifiers can be easily accommodated in actual applications. The influent is introduced into a feed channel entirely around the periphery of the tank. The channel is preferably of uniform width, with the depth gradually decreasing, from the deepest point at the influent point to the shallowest at the extreme end of the circle. A series of properly sized ports are correctly spaced in the floor of the feed channel. This controlled horizontal-flow velocity prevents any settling out of solids in the feed channel and assures the transportation of all scum to the end of the feed channel for collection. A horizontal deflector baffle is located just above the tank floor. This directs the flow outward into the main body of the tank. Since the flow is thoroughly diffused and at minimum velocity, solids promptly drop out of suspension onto the tank floor. The principle is applicable to tanks of any size, even the largest. Existing tanks can usually be modified to obtain the benefits of this new principle. For further details write Chain Belt Co., 4600 West Greenfield Ave., Milwaukee 1, Wisc., or circle **No. 11-13.**

Measuring Differential Pressure and Flow

A new line of force balance transmitters which measure and pneumatically transmit flow, differential pressure, level, and specific gravity over wide ranges, is now being manufactured by Bailey Meter Co. Transmitters measure over a minimum range span of 0-2 ins. water under service pressures to 50 psig, to a maximum span of 0-2000 ins. water under service pressures to 5000 psig. No viscous or other dampening devices are needed. Stability is maintained by a newly developed reset type booster relay. Three standard measuring diaphragms provide all ranges. Ten to one differential range change is possible with simple screwdriver adjustment. Air consumption is only 0.07 scfm at balance on dead end service. Standard SAMA transmitting signal ranges of 3-15 or 3-27 psig are utilized. For more details write Bailey Meter Co., 1050 Ivanhoe Road, Cleveland 10, Ohio, or circle **No. 11-14** on the reply card.

Bailey force balance transmitter is used for gases, water and other fluids

Paves on Crawlers: Travels on Rubber

Barber-Greene's new Model 873 asphalt finisher has retractable pneumatic tires

A new concept in asphalt paving; a finisher which paves on crawlers for maximum flotation and traction, then travels from job-to-job at 30 mph on rubber tires is available from Barber-Greene. With laying widths from 6 to 12 ft., in 3-in. increments, the Model 873 was designed to provide highest quality mats for such applications as paving driveways, parking lots, filling stations, drive-ins., etc. It can also be used in paving shoulders along either asphalt or concrete highways, turnout paving and for the construction of acceleration and deceleration lanes along expressways and turnpikes. To provide utmost mobility, it is equipped with power operated, hydraulically retractable pneumatic tires and a towing tongue which may be attached or detached in seconds. It also offers tamping, leveling and thickness control principles, exactly as does the company's larger finisher. For more details write the Barber-Greene Co., Aurora, Ill., or circle **No. 11-15.**

Outstanding Features In New Vise Stands

The addition of two new combination vise and vise stands to their already extensive line of pipe tools has recently been made by The Toledo Pipe Threading Machine Co. The new vise stands, the 7C with chain vise, ⅛ to 5 ins., and the 7Y with yoke vise, ⅛ to 2½ ins., are said to contain several new features exclusive with Toledo. Compound leverage is applied to a chain that falls into a lever hook automatically, requiring minimum turns on the screw. Either model can be easily converted from chain to yoke or yoke to chain with just a few additional parts. Both vise stands have a strong steel folding tray that prevents collapsing. The large vise bases have 3 pipe benders located over the rear leg, eliminating tipping when bending pipe, plenty of tool slots and handy ceiling brace screw. The rubber grommets in the feet prevent creeping. Complete information from The Toledo Pipe Threading Machine Co., 1445 Summit St., Toledo, Ohio, or circle **No. 11-16** on the reply card.

Vise stands used in water departments

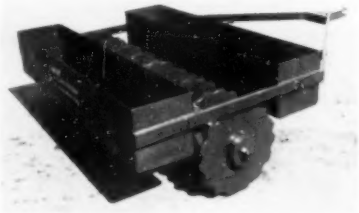
Mobility in the Construction Field

The Samson multiple-purpose excavator, available from Crane Carrier Corp., is full-hydraulic and full-swing to operate in the tightest positions. The excavator actually is 7 machines in one: a backhoe; shovel; crane; clamshell; grader; grapple; and magnet. Additional information may be obtained by writing Crane Carrier Corp., P. O. Box 5008, Tulsa, Okla. or circle **No. 11-17** on the reply card.

Two-Ton Roller Features Electric Self Starter

The new General two-ton roller is powered by a 9-hp Briggs & Stratton gas engine and features an electric self-starter using a 12-volt system. A sealed transmission and chain drive provide forward and reverse speeds from 0-2.9 mph. The body design permits the roller to work within ¾ in. of a building wall or curb. A specially designed automotive hydraulic foot brake insures safety stopping on any incline. The driver's seating position offers clear visibility on all sides, and makes close work particularly easy to observe. The weight with water ballast is 4200 lbs. For complete details write General Engines Co., Route 130, Thorofare, N. J., or circle **No. 11-18** on the reply card.

Mulch-Tiller For Roadside Maintenance



Unit can anchor straw or other mulch

A balanced weight, mulch-tiller has been developed by the Independent Mfg. Co. for use on road shoulders, embankments, levees and watersheds. It has proven efficient for anchoring straw or other mulch in the soil surface. It is built on a low line of gravity and weights can be added by sand or gravel, held in boxes. It is available in rubber mounting and its overall dimension is 6 ft. wide; it weighs 1000 lbs. Complete information is available from Independent Mfg. Co., Inc., Box 208, Neodesha, Kans., or circle **No. 11-19** on the reply card.

New Line of Blower Type Space Heaters

Aeroil has engineered and produced a brand new line of blower type space heaters with BTU outputs from 125,000 to 500,000. Wherever clean portable heat is necessary these new units are ready at the flick of a switch. They plug in on ordinary AC current and have an exceptionally high volume of air delivery without danger from carbon monoxide gas. Write to Aeroil Products Co. Inc., South Hackensack, N. J., or circle **No. 11-20** on the reply card.

Dodge 1-ton pick-up has a body length of 9 ft. and a capacity of 84 cu. ft.

1959 Dodge Trucks Feature All-New Sweptline Pick-up

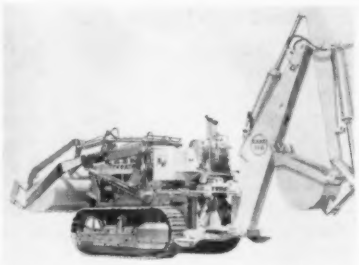
A completely new series of pick-up trucks with a larger payload capacity and bigger brakes are the highlights of the 1959 line of Dodge trucks. Other outstanding features of the "M" Series models include two new 318-cubic inch V8 engines, increased gross vehicle weights for tandems, concealed step running boards, a new hydraulically-operated clutch, and an all-new instrument panel and instrumentation. The new trucks feature 6 and 8-cylinder engines with 11 different horsepower ratings ranging from 113 to 234. Maximum gross vehicle weights range from 5,100 to 49,000 pounds. The new pick-up truck, the Sweptline, is offered with a 120-hp 6-cylinder or a 205-hp V-8 engine. Available in half, three-quarter and 1-ton models, the Sweptline series features body lengths from 6½ to 9 feet, capacities from 59.7 to 84 cubic feet, and payloads from 1,775 to 3,475 pounds. For more details write Dodge Trucks News Bureau, 2751 East Jefferson, Detroit 7, Mich., or circle **No. 11-21** on the reply card.

Automatic Colorimetric Water Analysis is Simple

A new chemical analyzer available from Florida Instrument Co., will for the first time make colorimetric water analysis simple and inexpensive for sewage plants and water works. Known as the Chemalyzer, this unit has no moving parts and no electric or pneumatic power is required for operation. Accuracy is adequate for normal sampling, ranging within 2 to 5 percent of the reading. Chemical properties such as pH, residual chlorine, and water hardness in water solutions can be monitored by the Chemalyzer, which can also be used effectively for titration control around a fixed end point. For example, water hardness control can be set at any predetermined level such as 5, 10, 20, 50 or 100 ppm of hardness by simply premixing the colorimetric reagent in the proper concentration to produce color change at the desired point. For more details write Florida Instrument Co., Division of Milton Roy Co., 1300 East Mermaid Lane, Philadelphia 18, Pa., or circle **No. 11-22** on the reply card.

Utility Crawler-Backhoe-Loader

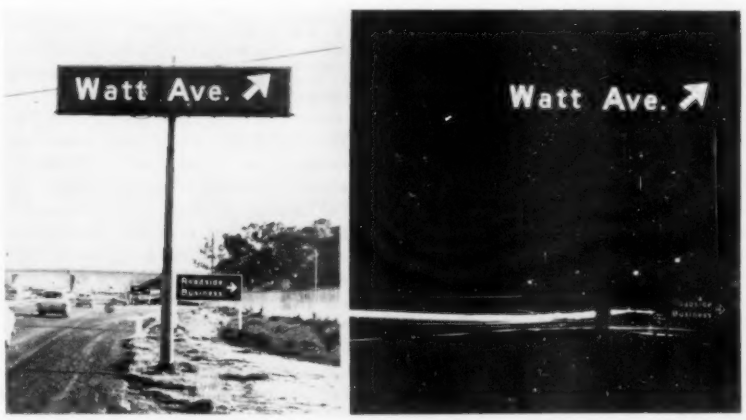
A new crawler-mounted utility trenching and loading machine is now being offered by the J. I. Case Co. Designated as Model 310 crawler-backhoe-loader, the basic tractor develops 30 drawbar hp and up to 5690 lbs. pull or push power. Case-built backhoe and loader are operated by 1600 psi hydraulic power supplied by 19 gpm tractor-mounted pump. Model 310's rear-mounted backhoe digs 12½ ft. deep, reaches more than 16 ft. from its pivot and swings 180°. It cuts more than 13 ft. of 4-ft. deep trench from one position. A special feature is foot-operated swing control which reduces cycle time by leaving operator's hands free to work bucket levers while swinging. The ⅝-yd. front-end loader exerts 4300 lbs. breakaway, lifts 2600 lbs., clears almost 9 ft. with bucket dumped. The unit is powered by a Case 42-hp engine which develops maximum 128 ft.-lbs. of torque at 2/3 rated rpm. The tractor is also available with backhoe and front-mounted bulldozer or angledozer, in place of the front-end loader. For complete data write J. I. Case Co., Racine, Wis., or circle **No. 11-23** on the reply card.



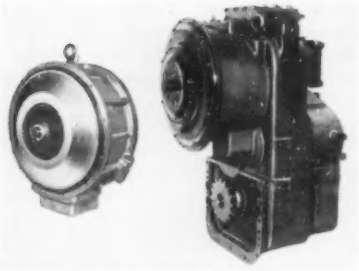
Case built backhoe and loader units

"Panelescent" Lamp Super-Highway Marking Sign

A new "Panelescent" lamp super-highway marking sign, described as having "many times more driver readability" and lower power consumption is available from Sylvania. The lamp produces light over the entire surface of a panel by the principle of electroluminescence, the creation of light through the excitation of certain phosphors placed in an electric field. Only one-sixteenth of an inch thick, the lamp produces a uniform light without the use of bulbs, tubes, filaments, cathodes or heavy ballasting devices. Its construction consists of a porcelainized steel sheet with a ceramic-phosphor coating. The lamp letters of the 16-ft. by 4-ft. sign are mounted on a marine plywood backing and completely covered with an aluminum plexiglass window. The upper-case letters are 18 inches high and the lower-case letters are 12 inches high. The sign operates with a 580-volt control device on conventional 60-cycle, 115-120 volt supply. The sign is expected to have applications in marking highway turn-offs, routes, mileage and traffic warnings. For more information write Sylvania Electric Products, Inc., 1740 Broadway, New York 19, N. Y., or circle **No. 11-24** on the reply card.



Sylvania road marking sign can be used in marking turn-offs, routes and mileage



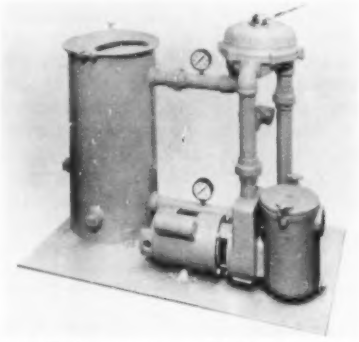
Hydra-Drives automotive torque converters and power shift transmissions

Hydra-Drives Round Out Rockwell-Standard Line

With the recent acquisition of the Hydra-Drives line of hydraulic torque converters and power shift transmissions from Westinghouse Electric Corp., the Rockwell-Standard Corp. has a complete line of drive components for heavy duty automotive equipment. The complete line includes, in addition to the Hydra-Drives torque converters and power shift Transmissions, driving front axles, non-driving front axles, rear axles, tandem axles and planetary axles. The torque converters were developed to meet special needs in earthmoving, construction and materials handling equipment. The unit provides the equivalent of a gear transmission with hundreds of ratios which automatically selects the right ratio to utilize the maximum power efficiently. They are designed for use on off-the-highway work where multi-speed operation is required in road graders, front end loaders and drilling and well-servicing equipment. With four speeds forward and reverse, the unit is ideally suited for vehicles that must travel in different directions during a normal work cycle. For complete details write Rockwell - Standard Corp., Transmission and Axle Div., Detroit 32, Mich., or circle **No. 11-25** on the reply card.

Purolator Swimming Pool Filter Provides Fast, Effective Filtration

A new compact swimming pool filter, re-circulating and purifying 45,000 gallons of water in approximately 16 hours, has been announced by Purolator Products. The new filter is engineered as two systems. One system, using Micronic[R] filter elements, is designed for use with municipal water supply. The other employs a sand and gravel filter tank to filter non-treated water from rivers, lakes, ponds and other natural sources. In both systems, the main filtering elements are preceded by over-size basket strainers to remove large particles from the water system before finer filtration is accomplished. Most solid pool contaminant can be pumped from pool to waste without passing through the filter by hooking a standard swimming pool vacuum cleaner attachment to the connection provided in the filter system. Complete re-circulation and purification take place continually through the filter media. The complete filter unit measures ¾ ins. in length, 30 ins. in height, and is 20 ins. wide. Easy installation is made



Installation of the pool filter is made by fastening two pipe connections

by fastening two pipe connections, 2-in. suction side and 1½-in. pressure side. Each ready-to-install unit is furnished with a new 5-way valve; a self-priming, ¾-hp pump; a noiseless motor unit; and connections for vacuum cleaner solid waste disposal and air elimination. For complete data write Purolator Products, Inc., Rahway, N. J., or circle **No. 11-26** on the reply card.

Sewer Pipe Sealer

Many cities, during wet seasons, find their sewage plants treating 60 to 70 percent ground water. In other cities, the problem is sand filtering into the sewers, leaving caverns under the streets. A solution is to seal the sewers from the inside. The Bernard-Pond sewer pipe sealer can perform a good job of sealing sewers without digging them up. The secret of its effectiveness lies in the fact that a thick, cementuous substance is forced through the sewer under pressure. As the sealing machine is drawn through the sewer by heavy steel cables, it seals all cracks, defective joints, flaws and pores permanently against infiltration by water, sand or roots. Next, a squeegee is drawn through to smooth the new lining. The mortar is allowed to harden, and the sewer is ready for service within three to four hours. A special blend of waterproof mortar is used, with a chemical additive to make it bond to the wet sewer pipe. The special heavy, durable plastic discs of the piston are flexible and conform to the shape of the pipe, making it possible to repair even out-of-round tile. Sealing is performed at the speed of a slow walk. For further details write Louis Bernard, 920 18th Ave. West, Eugene, Oregon, or circle **No. 11-27** on the reply card.

Sealer will repair and seal joints in concrete, steel or glazed tile pipe

Heads and Cutters for Light-Duty Earth Augers

Especially developed for farm tractor, soil sampling, seismographic and similar continuous-flight earth augers, two new versions of the fast-cutting Pengo auger cutting heads are now available from Petersen Engineering Co. Pengo light duty heads are designed for welding

Earth augers used in soils sampling

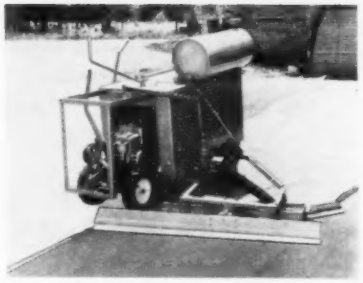
to single helix continuous-flight augers, or to light-gauge double helix augers where flights are not heavy enough to carry the bolt-on Pengo light duty shanks. The shanks are designed for bolting to twin helix continuous-flight augers. Both heads and shanks use the new Pengo #30 Wisdom tooth, a quick-change reversible tooth which provides double wear. Complete data by writing Petersen Engineering Co., Inc., 460 Kifer Road, Santa Clara, Calif., or circle **No. 11-28** on the reply card.

Heavy-Duty, High Capacity Feeders Fit Limited Installation Space

Syntron's new special model heavy-duty electromagnetic vibratory feeders are specifically designed for high capacity feeding where installation space is limited. These special model feeders combine two standard electromagnet drive units to provide the power necessary to convey heavy materials at fast feeding rates through an extra long trough. The separate electromagnet drives, which operate in alternate co-ordination, are mounted above and below the trough to eliminate the extra length required for standard electromagnet drive mounting, adapting them very practically to easy installation in restricted space. Wide range models offer maximum feeding capacities ranging from 25 to more than 1000 tons per hour in dry materials weighing approximately 100 pounds per cubic foot. Complete information from Syntron Co., 660 Lexington Ave., Homer City, Pa., or circle **No. 11-29** on the reply card.

Applicator Covers Up to 600 Sq. Ft. per Min.

An easy-to-operate, power-driven Higbee-Reichard application machine with which one operator can apply seal-coat materials to paving at the rate of 4 to 5 drums per hour is being introduced by Maintenance Engineering Co. The self-propelled machine, which operates forward or in reverse, is easily controlled by the operator. The applicator piles excess material into a small windrow at the edge, which keeps the material from setting-up until the next pass has been made—thus permitting a non-raveled, uniform blend



between successive passes. A new and improved Black Magic surface seal containing petroleum resistant latex has been announced along with the applicator; the addition of this surface seal is said to improve the flow of the material at the time of its application, and to increase its bonding and wearing characteristics. Write Maintenance Engineering Co., 16 West Johnson St., Philadelphia 44, Pa., or circle **No. 11-30.**

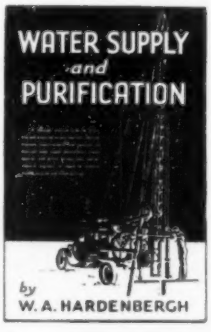
• • •

Costs for Curb and Gutter

Contracts for constructing curb and gutter have been let by Bricelyn, Minn., at $1.52 per lineal foot; and by Morgan, Minn., at $1.58 per foot for 2600 ft.

Water Supply and Purification

by Col. W. A. Hardenbergh



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NEWS OF ENGINEERS

E. H. BLACKWOOD, formerly Captain, CEC, USNR, has been recommended for promotion to Rear Admiral. He is with Armco Drainage & Metal Products, Charleston, W. Va.

JOHN W. SCULLY has become a partner in the Architect-Engineer firm of Johannessen & Girand, Phoenix, Ariz. A graduate of the University of Michigan, Mr. Scully, has had wide experience in acoustical problems.

WILLIAM A. PRESSELLER, Public Works Superintendent of Merced, Calif., for the past 5½ years, died on Sept. 13. He was a most valuable and devoted employee of the city and his passing was a severe blow.

WILLIAM C. MUEHLHOF, formerly Chief Engineer for the Philadelphia & Reading Coal & Iron Co. (now the Philadelphia & Reading Corp.), has been appointed City Engineer of Pottsville, Pa., effective September 1.

DR. W. D. PAINTER has become a partner of the firm of Clark, Daily & Dietz, consulting engineers of Urbana, Ill., Carlyle, Ill. and Memphis, Tenn. The following have also become Associates: H. W. Byers, P. W. Clinebell, B. C. Conklin, D. R. Smith, M. Fuat Tigrak, Jamison Vawter, A. G. Cox and D. J. Henry. All of the associates have been students of one or more of the partners, and all of the partners are former students of Professor Vawter who retired from the Civil Engineering Department of the University of Illinois a year ago.

JOSEPH P. LAWLOR has retired as president of General Filter Co., Ames, Ia., and has been succeeded by Merlin H. Anderson. Mr. Lawlor, who founded the firm in 1935, served in the Navy in World War II and more recently has been mayor of Ames.

• • •

Traffic Engineers Needed

There are three immediate vacancies in the Minnesota Highway Department for Traffic Engineers. Requirements are a civil engineering degree and some experience in traffic engineering. Salary range is $6,564 to $8,004. Write Civil Service Dep't., 122 State Office Bldg., St. Paul 1, Minn.

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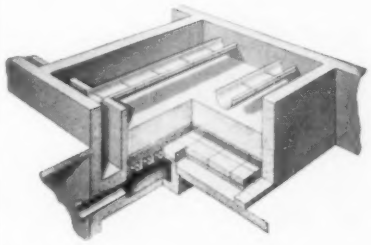

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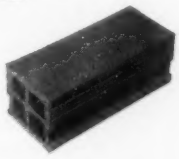

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ATLAS MINERAL PRODUCTS COMPANY
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by Arthur K. Akers

★ E. F. MILLER now heads Municipal Water Treatment Department of Graver Water Conditioning Co., New York, as manager.

Mr. Miller

Mr. Masefield

★ PFAFF & KENDALL, Newark, N. J., adds George Masefield, as liaison man between their new Highway Planning Committee and the various governmental units involved in highway lighting and signing.

★ WORTHINGTON CORPORATION is launching a new trademark to replace its old winged scarab one. A massive "W" design will now appear on every Worthington product from pumps to air compressors.

★ ROOTS-CONNERSVILLE BLOWER Division of Dresser Industries is establishing a new district sales office at 5912 Hamilton Ave., Cincinnati, headed by H. M. Borden.

★ T. RANDOLPH RUSSELL is the new director of public relations for the American Road Builders' Association, Washington, succeeding Robert L. Smith, recently deceased.

★ AMERICAN SOCIETY OF CIVIL ENGINEERS notifies our Col. W. A. Hardenbergh that on January 1, 1959 he becomes a Life Member.

★ U. S. PIPE & FOUNDRY CO., has blown in its new No. 5 blast furnace in Birmingham. It is the largest furnace in the country producing merchant pig iron.

★ C. E. LAMAR has been named assistant sales manager, Southern Pipe and Casing Co., Azusa, Calif.

★ ORANGEBURG MFG. CO., fibre pipe and conduit, has been acquired by The Flintkote Co., New York. Orangeburg will be operated as a Flintkote division, with no change contemplated in personnel and management.

★ JOHN L. GROTON fills the newly-created position of director of advertising and sales promotion, Essick Mfg. Co., Los Angeles. He was formerly with Reynolds Metals Co., Los Angeles.

★ CHARLES F. HILL becomes general manager, Industrial Division, Massey-Ferguson, Inc., succeeding Charles J. Davis. Mr. Davis

Mr. Hill

Mr. Davis

will remain in harness, however, until planning of 1959 programs is completed. He was formerly president of Mid-Western Industries. Massey-Ferguson also opens a Los Angeles branch combined with western regional sales headquarters for the western half of the U. S.

★ CHICAGO BRIDGE & IRON CO., Chicago, announces plans for expansions at its Greenville, Pa., and Salt Lake City, Utah, plants. It has just completed an addition to its Salt Lake City office building.

★ DEATHS in September include two old friends who were widely known in the Public Works field: I. M. (Mike) Glace, consulting engineer, of Harrisburg, Pa.; and Joseph J. Swenson, formerly vice president, sales, of American Cast Iron Pipe Co., Birmingham, and later city manager of Mountain Brook, Ala.

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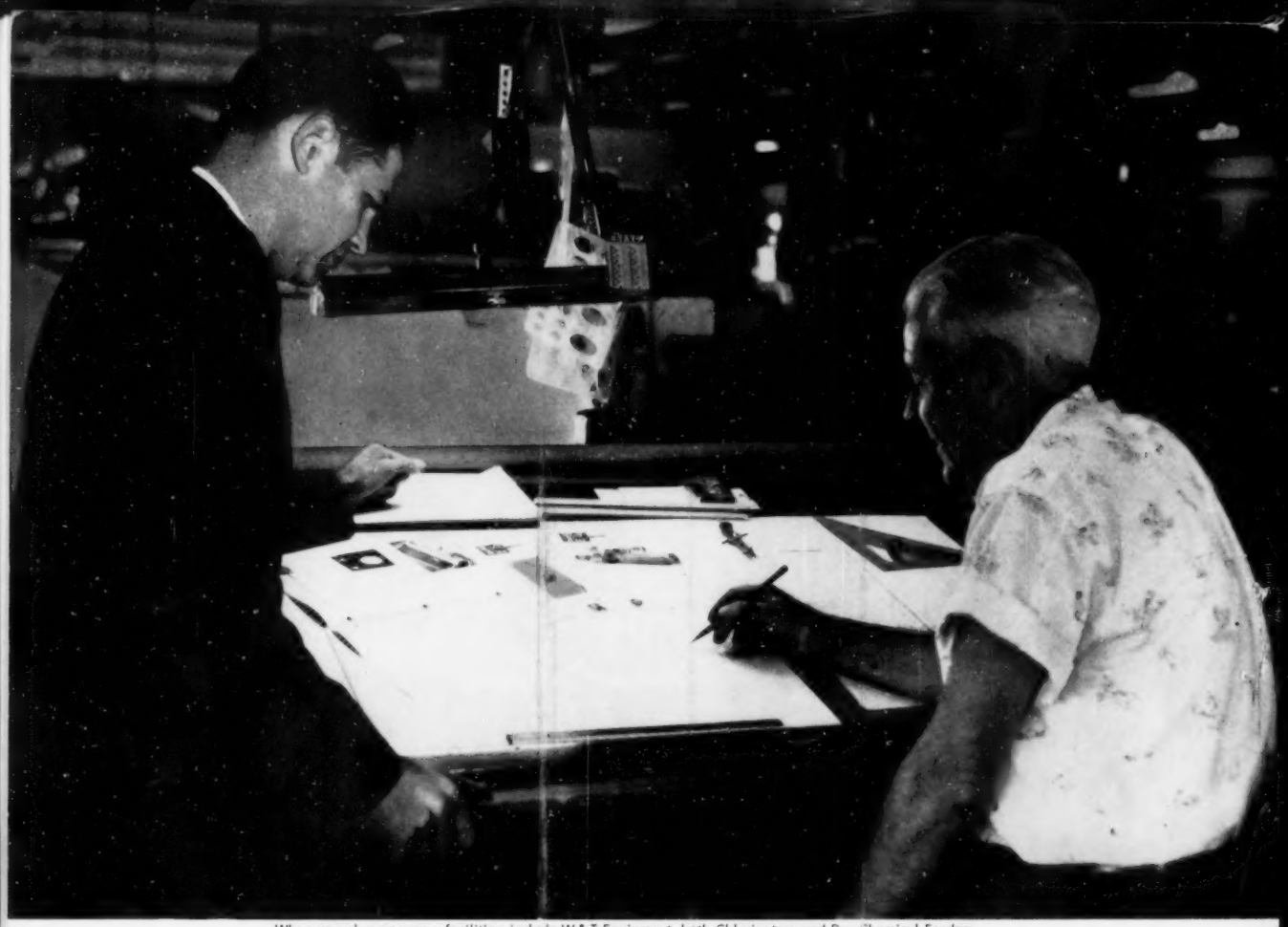

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